Digital Paradigm Shift: Unravelling Technological Disruption in Business

Edited by:

Dr. Preeti Khanna
Dr. Neha Sadhotra

School of Business Management Mumbai
NMIMS Deemed-to-be University

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EDITORS:

Dr. Preeti Khanna

Operations and Data Sciences, School of Business Management
SVKM's Narsee Monjee Institute of Management Studies
(NMIMS) Deemed-to-be-University, Mumbai, India
E-mail: preeti.khanna@sbm.nmims.edu

Dr. Neha Sadhotra

Marketing, School of Business Management
SVKM's Narsee Monjee Institute of Management Studies
(NMIMS) Deemed-to-be-University, Mumbai, India
E-mail: neha.Sadhotra@sbm.nmims.edu

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Editor: **Dr. Preeti Khanna & Dr. Neha Sadhotra**

Operations and Data Sciences & Marketing
School of Business Management (SBM), Mumbai
SVKM's NMIMS Deemed-to-University

Preface

In an era defined by rapid technological advancements, the intersection of technology and business has given rise to a transformative era, characterised by unprecedented innovation and disruption. From healthcare to business operations, from finance to governance, emerging technologies are not only influencing but fundamentally transforming the way we live, work, and interact. As we stand at the crossroads of the digital revolution, understanding and navigating the complexities of this landscape are more critical than ever. This book, "*Digital Paradigm Shift: Unraveling Technological Disruption in Business,*" is an exploration into the multifaceted impact of technological advancements on businesses, industries, and society at large. The book delves into the forefront of this technological revolution, exploring key domains where cutting-edge developments are reshaping the status quo.

The opening chapter *'Strategic Integration of IoMT in Preventive Healthcare'* takes us into the realm of healthcare, where the Internet of Medical Things (IoMT) is revolutionising preventive healthcare. From wearables to smart devices, the chapter explores how connected technologies are empowering individuals and healthcare professionals to proactively manage and monitor health. Moving into the domain of service operations, chapter 2 *'Generative AI in Customer Service'* unravels the role of Generative AI in enhancing efficiency and innovation. The chapter explores how businesses are leveraging AI to streamline operations, reduce costs, and create personalized experiences for customers. The next chapter 3 *'Metaverse and Future of Business'* explores the metaverse potential to redefine how we interact, transact, and conduct business, offering insights into the opportunities and challenges that lie ahead. The concept of the metaverse has transcended the realm of science fiction, becoming a tangible force with implications for business. Chapter 4 *'ONDC: Digital Public Infrastructure'* delves into the world of digital public infrastructure, focusing on the Open Network for Digital Commerce (ONDC). The chapter examines how this framework is laying the foundation for a digitally inclusive economy and transforming the way public services are delivered. Stablecoins, with their potential to revolutionize traditional financial systems, take centre stage in the next chapter on *'The Disruptive Potential of Stablecoins.'* Authors examine how these digital assets can disrupt

and reshape the financial landscape, offering both challenges and opportunities for businesses and industries. Chapter 6 *'Utilizing Social Media by Governments to Augment Citizen Engagement'* examines how social media platforms are being harnessed to enhance citizen engagement, facilitate communication, and build a more transparent and participatory governance. Chapter 7 *'Enhancing Competitiveness in Service Delivery Systems – Role of Technological Resources'* focuses on the role of technological resources in enhancing competitiveness in service delivery systems. From automation to data analytics, the chapter explores how organizations can leverage technology to stay ahead in a rapidly evolving market. The hiring landscape is evolving with the integration of AI. Chapter 8 *'AI in Recruitment and Selection: A Guiding Manual'* provides a comprehensive guide to using AI in recruitment and selection, exploring the benefits, challenges, and ethical considerations associated with this transformative approach. Chapter 9 *'Reshaping Talent Management Strategies: Role of AI'* delves into how AI is reshaping talent management strategies, from identifying and nurturing talent to creating inclusive and dynamic workplace cultures. Chapter 10 *'Navigating the Future of Work: Challenges and Strategies'* focusses on the future of work is marked by unprecedented changes. It navigates the challenges and strategies for organizations and individuals to thrive in a dynamic and tech-driven work environment. The final chapter *'Technology-Driven Operational Excellence'* explores the concept of operational excellence in the age of technology. From process optimization to risk management, chapter 11 demonstrates how organizations can achieve and sustain operational excellence in an ever-changing landscape.

As we embark on this journey through the technological frontier, each chapter offers insights, analysis, and practical considerations for navigating the transformative waves of innovation. Together, they paint a comprehensive picture of the evolving landscape, providing readers with the knowledge and perspectives needed to thrive in an era defined by technological disruption.

Editorial Team

Dr. Preeti Khanna is an Associate Professor of Operations and Data Sciences in the School of Business Management, SVKM's Narsee Monjee Institute of Management Studies (NMIMS), Mumbai campus. She has an overall experience of more than two decades in the field of Information Systems, and Technology Management in various capacities as an academician and researcher in business school. Her research interests lie in the domains of digital product and economy, human–computer interaction, and information systems. She is recipient of the Scholarship from 'Andrew Towl Endowment Fund' for the Global Colloquium on Participant-Centered Learning GLOCOLL at Harvard Business School, Boston, and attended the faculty development program at Harvard Business School, Boston, US. Her research works are presented in prestigious conferences and published in reputable journals. Her research has been published in *Qualitative Research in Financial Markets*, *Digital Policy, Regulation and Governance*, *South Asian Journal of Management*, among other journals of international repute. She can be contacted at: preeti.khanna@sbm.nmims.edu.

Dr. Neha Sadhotra is an Assistant Professor of Marketing and Program Chairperson, MBA HealthCare Management in the School of Business Management, SVKM's Narsee Monjee Institute of Management Studies (NMIMS), Mumbai campus. She is a Fellow in Marketing from IIM Lucknow with over 4 years of Management teaching experience. She has worked as a consultant for Coir Board- India, Ministry of MSME, Govt. of India and Pawan Hans Ltd. She is the recipient of the Liam Glynn Research Award by Center for Services Leadership, Arizona State University. Her research interests lie in the domain of HealthCare Service Excellence, Service robotics, Service Innovation, and Consumer adoption of technology. In Executive education, she has delivered learning and development initiatives for Mid-Level Sales and Marketing leaders across different sectors. Her recent engagements have been with Marketing Teams from Bayer Pharma, Dr Reddy's Laboratories Ltd., GSK, Larsen & Toubro, VFS, APOTEX, Elecon, Everest, etc. She can be contacted at: neha.sadhotra@sbm.nmims.edu.

Acknowledgement

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Corresponding Authors

STRATEGIC INTEGRATION OF IOMT IN PREVENTIVE HEALTHCARE

Preeti Khanna*

Operations and Data Sciences, School of Business Management
SVKM's Narsee Monjee Institute of Management Studies (NMIMS), Mumbai,
Deemed-to-be-University, India
E-mail: preeti.khanna@sbm.nmims.edu
(*Corresponding author)

Manjari Srivastava

HR and Behavioral Sciences, School of Business Management
SVKM's Narsee Monjee Institute of Management Studies
(NMIMS) Navi Mumbai, Deemed-to-be-University.

Neha Sadhotra

Marketing, School of Business Management
SVKM's Narsee Monjee Institute of Management Studies
(NMIMS), Mumbai, Deemed-to-be-University, India.

Abstract: *The advent of the Internet of Medical Things (IoMT) presents an exciting frontier in healthcare, promising to revolutionize the way we approach preventive medicine, patient care, and healthcare delivery. This study aims to study all possible applications of IoMT in the healthcare industry and the efficacy of IoMT in enhancing the journey of pregnancy by highlighting various advantages at different stages. A survey was done with a sample of 123 expectant mothers on the acceptance and use of wearables and smart devices. The empirical survey findings highlight that though the*

percentage of expectant mothers' usage of the IoMT device is low, they have positive perceptions about its benefits. Nonetheless, the survey respondents also perceive the risk associated with the usage. The research illustrates an integrated IoMT-based application design view for expectant mothers to assist them in the 9 months of their pregnancy. This study helps to understand by summarizing the current implications of IoMT in the healthcare industry.

1 Introduction

The realm of healthcare is experiencing a rapid technological revolution in the sphere of diagnostics and patient treatment. At the forefront of this revolution is the IoMT, a network of interconnected devices and sensors that leverage the power of the internet to revolutionize healthcare delivery. The IoMT platforms have the potential to offer holistic care by continuous monitoring of patient's health as digital healthcare has the scope of improved communication, efficiency, and effectiveness for patient outcomes (Su et al., 2021). Traditionally, healthcare has primarily focused on treating diseases after their onset. Medical 4.0 technologies that connect patient with healthcare professional has a lot to offer in patient patient-centered healthcare delivery system (Haleem et al., 2022). Ranging from mobile computing to cloud computing Medical 4.0 offers scope for sensors and wearable technology with AI, telemedicine through IoT, Robotic Process Automation and virtual reality, and many more that would empower medical professionals and patients to take both preventive and responsive measures (Haleem et al., 2022). IOMT facilitates the continuous monitoring of patients' vital signs, collecting health data, by leveraging sophisticated algorithms and artificial intelligence, the devices offer the scope of identifying early warning signs, detect deviations from normal health parameters, and enable timely interventions to prevent diseases from progressing. The devices develop personalized treatment plans tailored to the specific needs of each patient (Islam, et al. 2015; Zhou et al., 2017). By leveraging data analytics, machine learning, and predictive modeling, IoMT facilitates precision medicine; enabling healthcare professionals in making data-driven decisions that optimize outcomes and

minimize risks (Dwivedi et al., 2022; Manickam, 2022; Sestino & D'Angelo, 2023). As cited by Dewaqngan and Mishra (2018), smart technologies have the potential to play a significant role in the healthcare ecosystem, where everything is patient-centric. IoMT has garnered the attention from various industrial and academic researchers to fulfill the need for providing technology based health care solution (Zhou et al., 2017). The adoption of IoT is primarily a matter of decision-making by users. In the absence of complete information and uncertainties, users are led by both risk factors and possible benefits.

As per WHO, SDG goal 3.1 is maternal mortality and aims to prevent the maternal death ratio to less than 70 per 100000 live births. Since, maternal mortality holds extreme significance in sustainable development goals; the care services must utilize the opportunity by providing required infrastructure, treatment and informational support to the expectant women. Pregnancy involves numerous physiological changes and potential health risks. If a mother is unhealthy during pregnancy, it can have an impact on the child's growth and development, potentially leading to long-term health problems. Regular monitoring of the mother's health during pregnancy and the postpartum period can aid in the early detection of any health issues, thereby increasing the chances of successful treatment and avoiding complications that could harm both mother and child's health. The adoption of the IoMT in preventive healthcare for pregnant women holds immense potential to revolutionize prenatal care, promote maternal well-being, and improve pregnancy outcomes. Research by Li, X. et al., (2021) highlights both the significance and the challenges of IoMT and maternal healthcare. According to the study, the Smart maternal platform enhances work efficiency and facilitates pregnant women to attain treatment, yet there are challenges in aligning wearable devices with existing medical models, issues with the design feature in terms of size and portability, personal data, and privacy issues.

2   Theoretical Background

The TOE framework explains the mechanism of innovation adoption inclusively by incorporating the three contextual groups: technology, organization, and environment (Tornatzky et al., 1990). In the present context the TOE framework can be utilized to explain, the role of technology in assessing the interoperability of devices, the security of data transmission, and the ease of integration with electronic health records. The organizational characteristics while examining the internal factors of the healthcare organization may face challenges related to funding, IT infrastructure, and the willingness of staff to embrace new technologies. On the other hand, organizations that are technologically adept and have a culture of innovation might find IoMT adoption more feasible. The third environment may examine the external factors in healthcare, e.g. regulatory compliance and data privacy concerns that can significantly influence the adoption of IoMT technologies. The TOE framework is fruitful in bringing the deeper insights towards understanding IoMT and its complex adoption in healthcare.

There are very few studies related to pregnancy care using smart technologies and the adoption of technology among users. It is seen that maternal mortality is hospital-based. As per the WHO report (2023), "there has been incidents of maternal death almost every two minutes in 2020. 95% of all maternal deaths occurred in low and lower-income countries in 2020" (https://www.who.int/news-room/fact-sheets/detail/maternal-mortality). Monitoring during pregnancy is most crucial and needed to secure the well-being of the woman. The usage of healthcare apps for pregnant women is found to be limited among expectant mothers. With the pregnancy progression from 70% in the first trimester to 41.3% in the third trimester, the use of health information apps gets reduced. This is primarily because the relevant content on the app as the pregnancy progressed has been found to be limited. Although IoMT offers benefits of remote monitoring yet there are limitations with respect to a narrow focus on specific health problem and its sensing capabilities. Research is needed to assess the adoption of technology among users and its effectiveness in improving pregnancy outcomes and maternal health. The is also a need to understand the factors that influence

user acceptance and engagement with the technology, privacy concerns, the potential risks associated with reliance on smart technology for pregnancy care, the perspectives from healthcare providers concerning their preparedness using IoMT-based systems, and available resources. The implementation challenges of such maternal long-term IoMT-based systems warrant attention. Investigating the perspectives, attitudes, and challenges faced by healthcare health institutions/professionals incorporating these technologies can provide valuable insights for improving their adoption and implementation.

3   Research Objective

Patients today are well-versed with technology, and willing to put effort into their wellbeing using technology. Listening to patients' needs is critical in preventive healthcare. Thus technology enabled health care can improve the efficiency in the system, provide higher quality of care by lowering demand costs (Little, 2018). The objective of this study is two-fold First, first it aims to identify multiple IoMT options and applications in the healthcare industries that will benefit both patients, doctors, and hospital management. The research design is to conduct a comprehensive review and empirical study to investigate and identify existing evidence on the use of smart technologies such as IoMT (mobile apps, wearables, smart wristbands, and so on) in the healthcare ecosystem. The domain of the health care system is vast and varied, drawing from WHO sustainable goal 3.1 of maternal health care. The authors intend to draw attention to concerns regarding maternal health care. Hence, the other objective of the study is to understand the usefulness of IoMT devices in tracking stages of pregnancy and preventing complications to ensure timely interventions and promote healthy development of child and mother. With the advent of new-age technologies, the healthcare system has also recognized the potential it has in revolutionizing the healthcare services by involving stakeholders all the way (Wang et al., 2015). The present study aims to study the following research questions (RQs) as follows:

- RQ# 1 To identify multiple IoMT options and their applications in healthcare by exploring and reviewing use cases from multiple stakeholders' perspectives that can add value in preventive healthcare.

- RQ# 2 To understand how hospital management can sense the advancements of adopting smart technologies in maternal health care by investigating expectant mothers' awareness and perceptions about IoMT adoption in their journey.

To answer the RQs, we conducted extensive secondary research, and a survey to collect quantitative data from pregnant women in urban areas of India. Based on the analysis of literature as well as quantitative data we come up with a model, sympathetic_Care_9 workflows which can help to boost the engagement of an expectant mother. This study will help in multiple ways. Our findings may be of interest to researchers studying different aspects of smart technology adoption and development for the healthcare industry, healthcare professionals, and hospital management systems.

The remaining paper is structured as follows. Section 4 explore eight different domain related to preventive care which can be smartly handled by adopting IoMT. Section 5 details the methodology and quantitative analysis specific to pregnant women and Section 6 discusses the findings. Section 7 describes the implications of our study in practice. Section 8 acknowledges the limitations and details future scopes of this study. Finally, Section 9 concludes the study with a summary.

4   Use cases of IoMT in healthcare

Multiple authors (Alansari et al., 2018; Rodrigues et al., 2018) have reviewed the usage of IoMT and other smart technologies in the healthcare sector and found that it enhances the overall experience of patients. The following sub-section describes the cases.

4.1 Supporting anywhere anytime solutions

The integration of IoMT in healthcare has revolutionized the concept of "anywhere anytime solutions," providing support and enhancing accessibility to healthcare services regardless of geographical location or time constraints. It offers not only to monitor patients 'anywhere and anytime' but also connected to the user terminal through the cloud. The studies show various examples where, a Continuous Glucose Monitor solution, glucose level sensing (Hall et al., 2018); electrocardiogram monitoring (Guo et al., 2016); heart rate, skin temperature, and movement monitoring (Muthu B 2020); Oxygen Saturation Monitoring (Seifi et al., 2018); have been explored by researchers in the past to monitor health over a network by enhancing the ability and quality of life for people. Some of the studies have also shown the use of smart devices in performing the clinical trial (Martinez et al., 2017), to monitor diabetic patients using "Diabetes Care Sim" (Gonzales et al., 2019), to monitor patients with chronic illness remotely using "Neuro Sky" (Byrom et al., 2018), to provide the hidden pattern and insights on health parameters using "Proteus" (Dutta et al., 2018), to provide the vital information about the change in behavior for elderly ones using "Mimobaby" (Wang et al., 2017), and to trace walking pattern using "Misfit" (Kaewkannate & Kim, 2016). The integration of IoMT in healthcare enables the provision of anywhere anytime solutions, breaking down barriers related to time, location, and physical access to healthcare services. It empowers individuals to take control of their health, facilitates remote monitoring, enables telemedicine, and provides access to valuable healthcare resources and support, regardless of geographical boundaries or time limitations.

4.2 Supporting Elderly people

IoMT plays a vital role in supporting elderly people, offering a range of benefits to improve their healthcare, safety, and overall well-being. Healthcare providers can remotely assess their health status and intervene promptly if any abnormalities are detected. The literature discusses emerging technology solutions support aging (Rantz et al., 2013; Phillippa, 2018) like monitoring health parameters (Peetoom et al. 2015, Kaye et al., 2011), identifying emergencies (Gill et al., 2016), automating their day to day activity (Fausset et

al., 2011; Ghazal & Al-Khatib, 2015), and safety concerns (Nauha et al., 2016; Gibson et al., 2015; Lorenz et al., 2017). IoMT devices, such as wearable sensors or smart home systems, can detect falls or emergencies. These devices automatically alert designated caregivers, family members, or emergency services in case of a fall or medical emergency, enabling rapid response and potentially life-saving interventions. Another relevant example is 'Smart pill dispensers' that provide alerts to elderly / caregivers of alizhimer patients for the timely medication (Minaam & Abd-Elfattah, 2018). These smart IoMT solutions contribute to independent living, timely healthcare interventions, and improved outcomes, enabling the elderly population to age in place while receiving the necessary support and care.

4.3 Asset Monitoring and Maintenance

IoMT supports asset tracking and resource allocation during emergency transport. It enables real-time monitoring of medical equipment, supplies, and medication inventory, ensuring that emergency vehicles are well-equipped and have the necessary resources to provide optimal care. This helps streamline emergency operations, improve resource utilization, and enhance the overall efficiency of emergency transport. Studies on remote tracking of assets have shown to have improved patient experience. Some of these examples include imminent healthcare solutions (Dhanvijay & Patil, 2019); predicting the arrival of patients in PACU (Card et al., 2015) and hence reallocation of the assets and staff if needed; hand hygiene compliance (Dyson & Madeo, 2017); medication management (Pang et al., 2013); Wheelchair management (Lamana et al., 2017) and Real-time location services (Vidya et al., 2018). By integrating IoMT and smart devices with the processes it generates vast amounts of data on asset performance, maintenance activities, and usage patterns condition and performance of healthcare assets, such as equipment temperature, vibration levels, or usage patterns. By leveraging predictive analytics, IoMT can proactively support predictive maintenance, proactively identifying maintenance needs and reducing the risk of equipment failure or downtime (Kim et al 2022). Healthcare providers can derive valuable insights to optimize asset management strategies by leveraging data analytics and machine learning algorithms. This includes identifying patterns

of asset failure, optimizing preventive maintenance schedules, and making data-driven decisions regarding asset acquisition or retirement (Dash et al., 2019).

4.4   Supporting emergency transport

The integration of IoMT in healthcare has significant implications for supporting emergency transport and enhancing the efficiency and effectiveness of emergency medical services. IoMT facilitates remote medical assistance during emergency transport (Dwivedi et al., 2022). Healthcare providers can remotely assess a patient's condition and provide real-time guidance to emergency medical personnel through telemedicine platforms or video conferencing. This enables timely decision-making, enhances the accuracy of medical interventions, and improves patient outcomes, especially in cases where specialized expertise is required. The role of ambulance staff is highly demanding due to their responsibility for treating more critical patients, where making timely decisions is crucial for the patient's life. However, the implementation of IoT technology in ambulances has proven to be highly effective by enabling remote medical teams to provide necessary guidance and recommendations regarding patient care (Al-Kahtani, et.al., 2022). IoMT can be integrated with GPS and geolocation technology to track the location of emergency vehicles and optimize routing (Chowdhary et.al., 2023). This helps emergency responders navigate efficiently through traffic, choose the fastest routes to reach the destination, and provide timely assistance to patients in critical condition. By reducing response times, IoMT supports faster access to emergency care and potentially life-saving interventions. RedNinja pioneered the innovative development of the Life First Emergency Traffic Control (LiFE) algorithm, which modifies traffic light patterns or durations during emergencies to prioritize the passage of ambulances and emergency service providers (Al-Kahtani et al., 2022). The integration of IoMT in emergency transport would have the scope of patient safety by timely intervention, informed decision-making, and seamless transitions of care.

4.5   Supporting pregnant women

IoMT plays a crucial role in supporting pregnant women by providing various benefits throughout the pregnancy journey. Researchers (Kim et al., 2015; Pearce et al., 2013) mentioned that monitoring technologies support physical activities in pregnancy. This real-time monitoring helps detect any deviations from normal health parameters and addresses the needed concern to tackle potential impediments. Many more opportunities could be availed by using IoMT by understanding the special needs of maternal care (Conway et al., 2018; Facco et al., 2017; Gay et al., 2017). IoMT devices collect comprehensive data on a pregnant woman's health, including preexisting conditions, genetic factors, and lifestyle choices. By analyzing this data, healthcare providers can work towards creating need based care plan for pre and post maternity stages. IoMT facilitates telemedicine, enabling pregnant women to have virtual consultations with healthcare providers from anywhere. Through video conferencing or telecommunication platforms, women can discuss their symptoms, receive diagnoses, and obtain medical advice or prescriptions. This eliminates the need for physical travel, especially for individuals residing in remote areas or those with limited mobility. Some apps that are popular among women are the Indian Women, Pregnancy & Childcare Community app; Pregnancy Week By Week app; Indian Pregnancy, Baby Care Tips & Conception app; Pregnancy Day by Day app; and First Time Pregnancy app (AppAnnie, 2020). IoMT devices provide pregnant women with access to educational content, reminders, and personalized guidance. They can receive information about nutrition, exercise, prenatal care, and warning signs to look out for. This empowers women to make informed decisions, adopt healthy behaviors, and actively participate in their own care (Dwivedi et al., 2022). IoMT can extend its benefits to the postpartum period, monitoring maternal health and facilitating early detection of postpartum complications (Nasrabadi et al., 2015). This ensures appropriate follow-up care, reducing the risk of postpartum complications and supporting maternal recovery. By leveraging the power of IoMT, pregnant women can receive continuous care, timely interventions, and access to valuable healthcare resources, ultimately improving maternal and fetal health outcomes (Dwivedi et al., 2022).

4.6   Pilot study and analysis

Though the technology adoption may have several benefits, we identified a significant research gap on the adoption and acceptance of IoMT especially in health care in the present context. This study builds on the future usage of IoMT by expectant mothers as one of the most important stakeholders. The questionnaire entails the participant demographical information and the second section of the questionnaire was about usage patterns and perception of the smart devices while adopting in day-to-day activity during pregnancy. A questionnaire was designed having 14 items and using a six-point Likert scale, from 1= strongly disagree to 6= strongly agree. The Cronbach alpha coefficient of the questionnaire was 82.2 percent. Following a snowball technique, the participant was identified, and informed consent was taken from them. The survey was shared online with 149 expectant mothers, 131 questionnaires were received back and after cleaning the data finally, 123 were found to be usable for the study. The age group was between 21 years to 35 years. The majority of the survey respondent was from the metro cities of India (96 in no.) and the remaining (27) were from non-metro cities. For the present analysis, the response categories from one to three were summed up and were coded as 'disagree' and response categories from four to six were summed up and recoded as 'agree'. The data collected from expectant mothers showed the following pattern. The result shows the perception and usage of IoMT devices among pregnant women. From the 'experience' perspective, the result is average where 16% have experience of using IoMT devices, and 35% of them intend to use it in the future during pregnancy. Overall, 58% of the respondents who are expected mothers agree that smart devices and wearables can bring benefits and flexibility by effectively managing communication on a real-time basis.

The perceptions towards technology and its benefits find favor for IoMT devices and, the intention to use is positive as shared by 35% of respondents. A fair percentage of expected mothers are concerned about data security on usage. Concerns are also there for health risk during pregnancy (54% of the total respondent agrees). From the frequency usage point of view, respondents

perceive it to be complex. 78% of the respondents felt that it is complex and there are sufficient skills required to use it.

5   Discussions

The adoption of the IoMT in preventive healthcare has significant implications not only in the case of pregnancy but also in other domains. Continuous monitoring helps identify any potential complications or deviations from normal health parameters in real time. IoMT devices have the capability to track various parameters associated with pregnancy, such as fetal heart rate, uterine contractions, and glucose levels, among others. Through the collection and analysis of this data, healthcare professionals can detect early signs of complications like preeclampsia, gestational diabetes, preterm labor, or other high-risk conditions related to pregnancy. Early identification facilitates timely interventions, mitigating the severity of complications and enhancing outcomes for both the mother and the fetus. The use of IoMT allows healthcare providers to compile extensive data on a pregnant woman's health, enabling continuous monitoring of her unique requirements throughout the entire pregnancy process. This information becomes invaluable for crafting personalized care plans, taking into account factors such as existing health conditions, genetic predispositions, and lifestyle choices. By implementing tailored interventions, healthcare providers can address specific risks and offer individualized guidance to optimize the well-being of both the mother and the fetus. IoMT devices empower women to actively engage in their healthcare journey, encouraging the adoption of healthier lifestyle choices, adherence to prenatal care guidelines, and informed decision-making. Through this promotion of patient engagement, IoMT facilitates a collaborative approach between healthcare providers and pregnant women, ultimately contributing to enhanced pregnancy outcomes. Pregnant women can consult with healthcare providers through telemedicine platforms, discuss concerns, review monitoring data, and receive guidance. This improves access to care, particularly for women in remote or underserved areas, while minimizing disruptions to daily routines and need for in-person visits. This helps identify potential complications or triggers for early intervention,

ensuring the best possible outcomes for both mother and baby (Dwivedi et al., 2022).

The healthcare companies are prepared to offer a personalized experience to patients. The technological advancements and digitization are enabler of high-quality patient care. We have realized that patients proactively take care of their health. The study results also confirm the positive outlook towards IoMT devices and at the same time the perceived risk that may pose a threat to the success of such technological advancement.

Reflecting via TOE framework, the technological attributes could include the assessment of interoperability of devices, secure data transmission, and integration with health records. The Organizational characteristics may need to focus on funding IT infrastructure and the willingness of staff to embrace new technologies. From the perspective of the environment, IoMT enablers would need to ensure regulatory compliance and create broader maternal healthcare systems for the adoption of IoMT devices. The strength of the TOE framework lies in providing a deeper understanding of the multifaceted nature of technology adoption, acknowledging that it's not about the technology itself but also about the organizational capabilities and the external landscape. Researchers highlight issues concerning the non-adoption of these technologies for example, complexities related to regulation (Garell et al., 2016), complexity due to changes in the workflow (Granja et al., 2018), the concern of patients/providers on security of data (Devlin et al., 2015). To provide a solution we also sought to examine the role of IoMT in the healthcare industry, specific to the Sympathetic Care_ 9 workflows as described in Figure 1 which might motivate the expectant mother towards technology usage. This study will help in expand the knowledge at the academic and practitioner levels to appreciate the importance of smart technologies towards patient care, timely diagnosis, preventive care and through treatment.

6   Implications

Implications for Consumers and Patients - Consumers can be remotely monitored by healthcare professionals through IoMT devices. This is particularly valuable for capturing data for chronic illness, and effective intervention. IoMT devices, such as wearables and connected health apps, allow consumers to not only track their health and wellness metrics but also to personalize healthcare plans and interventions based on an individual's specific needs and goals. They can receive alerts and recommendations based on their health data, promoting preventive actions and reducing the risk of more serious illnesses. Interactive IoMT devices engage consumers in their own health, promoting healthier behaviors. Gamification and social features in health apps and wearables can encourage people to stay committed to their wellness goals.

Implications for Hospitals - At larger scale the IoMT devices offers a latitude for automated data collection and avoidance of human error in data management. This streamlined data flow can improve the accuracy of patient records and decrease administrative burden. In case of re-occurring of ailment or re-hospitalization the patient's data can be tracked and monitored. Real-time patient data from IoMT devices can help hospitals allocate resources more efficiently. For instance, patient flow can be managed based on real-time occupancy and can be used for predictive analytics, enabling hospitals to anticipate patient needs, optimize bed utilization, and allocate staff resources more effectively. IoMT facilitates telehealth services, allowing hospitals to provide virtual consultations and reach patients who may have difficulty accessing in-person care.

7   Limitations and Future Research Direction

The study is represented through a case-based approach supported by strong literature, which is explorative in nature. The study could be enhanced by analyzing a larger sample of pregnant women by designing a detailed research design with multiple controls like socio-economic strata and educational background. A suggestion for future work is to prepare the study for multiple groups under the umbrella for self–care where technology is

being intended. Detailed research design could be designed for specific groups like pregnant women, older people, and caretakers of children and instigation could be done by understanding the usage of smart technologies and how they contribute to the risk they face. As IoMT technologies continue to evolve and become more prevalent, it is important to conduct cost-effectiveness analyses to determine the economic implications of implementing these technologies in preventive care for pregnant women. Assessing the cost-effectiveness and potential return on investment can guide policymakers and healthcare systems in resource allocation and decision-making. The ethical and privacy concerns with data management also increase. Further research is needed to explore the ethical implications and privacy safeguards associated with the use of IoMT devices in prenatal care. This includes examining data security measures, informed consent processes, and ensuring that pregnant women have control over their personal health information. Understanding user acceptance, satisfaction, and potential barriers to adoption can help tailor interventions and improve the overall experience of utilizing IoMT in prenatal care.

8   Conclusion

In conclusion, the adoption of IoMT in preventive healthcare for pregnant women has the potential to revolutionize prenatal care, promoting early detection, personalized interventions, and improved maternal and fetal outcomes. With responsible implementation and careful attention to privacy and security, IoMT can be a valuable tool in optimizing the preventive health of individuals. This study shows that there exist remote monitoring healthcare IoMT-based solutions from the patient, provider as well as from hospital perspectives. There are multiple benefits of adopting IoMT in the healthcare ecosystem as mentioned above. This study shows how smart technologies can help and contribute in each phase of the expected mother's journey of 9 months and even after that. Emphasis should be given towards IoMT adoption in maternal care.

APPENDIX

FIGURE 1 Sympathetic_ Care_ 9 Workflow

To be Mother Registers on the app which is linked to the lab test canter and gets notification on the blood test/urine test reports

The expectant woman enrols on the social website linked to app to get in touch with other Expectant women

The app syncs with the gynaecologist's calendar and also with the reports from the gynaecologist

The app also is in real time sync with the sonographer to get updates on the scans and the baby's growth

The woman uses a wearable to track her physical activity and health stats on the app

The app helps the woman track her scans and appointments

The app also has the feature where the mother can share the data with her family members like – spouse, parents, in laws etc.

It also has the provision to give periodic updates, recommendations to the mother on the friendly facts, hospital checklists etc

The app offers other extended features where the mother can share the medicals bills online with the insurance company for reimbursement

Mother can keep track of child's growth and get frequent updates on the progress of the baby

It will also assist the parents to sync with the paediatrician's prescriptions, appointments and child's vaccine schedules

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About the Authors:

Preeti Khanna is an Associate Professor in the area of Operations and Data Sciences in School of Business Management, SVKM's Narsee Monjee Institute of Management Studies (NMIMS), Mumbai. She has an overall experience of more than two decades in the field of Information Systems, and Technology Management in various capacities as an academician and researcher in business school. Her research interests lie in the domains of digital product and economy, human–computer interaction, and information systems. Preeti Khanna can be contacted at: preeti.khanna@sbm.nmims.edu.

Manjari Srivastava, has an overall experience of more than two decades in the field of business management in various capacities as an academician, researcher and academic administration in business school. Currently, she is a professor of HR and Behavioural sciences at School of Business Management SVKM's Narsee Monjee Institute of Management Studies (NMIMS) Navi Mumbai Campus. Her research interests are in the area of Leadership, positive psychology, mindfulness, employee voice, managerial and group effectiveness.

Neha Sadhotra is an Assistant Professor of Marketing and Program Chairperson, MBA HealthCare Management in the School of Business Management, SVKM's Narsee Monjee Institute of Management Studies (NMIMS), Mumbai campus. She is a Fellow in Marketing from IIM Lucknow with over 4 years of Management teaching experience. Her research interests lie in the domain of HealthCare Service Excellence, Service robotics, Service Innovation, and Consumer adoption of technology.

GENERATIVE AI IN CUSTOMER SERVICE

Neha Sadhotra*

School of Business Management School
SVKM's Narsee Monjee Institute of Management Studies
(NMIMS) Deemed-to-be-University, Mumbai, India
E-mail: neha.sadhotra@sbm.nmims.edu
(*Corresponding author)

Nimish Gupta

Data and Analytics Director, BCG X, Bengaluru, India

Abstract:

Generative Artificial Intelligence (AI) is at the forefront of technological innovation, transforming services across multiple domains. It has reshaped services by automating tasks, enhancing customer engagement, and optimizing operations. Characterised by models like GPT-3 and Generative Adversarial Networks (GANs), Generative AI has gained immense prominence in service industries due to its ability to generate human-like content, converse with customers, and optimize processes. It has revolutionized the service industry by enabling automated content generation, personalized recommendations, and interactive chatbots. As research in this field continues to evolve, it holds the potential to further transform the way services are delivered, making them proactive, more efficient, personalised, and engaging. This chapter delves into the transformative impact of Generative AI across various service sectors, highlighting its applications, benefits, and challenges. We explore how businesses across diverse domains are leveraging Generative AI to enhance customer experiences and streamline operations. The far-reaching applications of Generative AI in services, from

natural language processing to personalized recommendations are also covered.

Keywords: Generative AI, Machine learning, NLP, Chatbots, Customer engagement, personalisation, Customer service.

1. The Evolving Landscape of Customer Service

Customer service is the assistance that a company or organisation offers to its clients before, during, and following a transaction or other engagement. It includes a variety of acts and exchanges meant to guarantee client happiness, address problems, and sustaining favorable interactions between the company and its customers. Efficient customer service includes providing prompt and courteous contact, responding to client inquiries, resolving issues and providing excellent service to meet or beyond client expectations anticipations. It is essential for creating and preserving a devoted clientele and cultivating a favorable image for the business.

The evolution of customer service has been a remarkable journey reflecting the changing dynamics of consumer behavior and technology. In the past, customer service was predominantly face-to-face or phone-based, emphasizing interpersonal skills and problem-solving abilities. However, with the digital age, the landscape has transformed significantly. Today, customer service spans across various channels, including social media, email, chatbots, and self-service portals. Automation and artificial intelligence have become integral, offering quicker response times and 24/7 availability. Additionally, the focus has shifted towards proactive service, personalization, and predictive analytics to anticipate customer needs. The customer's voice now wields greater power through online reviews and feedback platforms, making businesses more accountable. This ongoing evolution underscores the importance of adaptability in meeting the ever-changing expectations of today's consumers.

Based on McKinsey's 2022 research, the majority of millennials anticipate receiving customer service in real-time. The study suggests that meeting these

service expectations is challenging due to escalating cost pressures, making the conventional solution of hiring additional well-trained employees impractical. On average, Americans dedicate 13 hours annually waiting in telephone queues, as reported by Dukes and Zhu in 2019. Organizations have developed dedicated customer services departments to keep up with the latest customer service technologies and strategies. Given the simultaneous increase in cost pressures and service expectations, the apparent solution of hiring more proficient employees to provide excellent customer service is not a feasible choice. Emerging technologies such as AI and the Internet of Things (IoT) present a unique opportunity to revisit the customer's journey of its interaction with the organization. The future of customer service is anticipated to be most significantly impacted by AI, which will allow businesses to promptly address customer concerns by delivering more predictive responses and more individualized offers.

2. The Rise of Generative AI

The simulation of human intelligence processes by machines, such as computer systems, is known as artificial intelligence. Voice assistants on our gadgets, such as Siri and Alexa, are a common instance of artificial intelligence in daily life. These are designed to think and act like humans thanks to AI technology. Artificial intelligence is a subset of machine learning. Through models that can learn from data patterns without the need for human intervention, machine learning practitioners create artificial intelligence.

In the 1930s and 1940s, researchers started working on the foundational machine learning technologies. In the 1970s, powerful computers were developed to run machine-learning algorithms. Until last year, machine learning was primarily focused on predictive models, that enabled researchers to identify and classify patterns in data. As an illustration, consider the classic machine-learning problem of determining whether an email is spam or not. After finding patterns in the emails, the computer would carefully examine each one to see if it fit the spam email pattern. AI generative is revolutionary. Machine learning can now generate an email's text rather than just seeing and categorizing emails. Humans trained the early text-based machine learning

models to categorize different inputs based on expert-tagged labels. One example of this is a natural language model that has been trained to classify messages on social media as either positive or negative. This type of training is referred to as supervised learning since a human is in charge of teaching the model to recognize a pattern.

With advancement of technology the new wave of text-based machine learning models like generative adversarial network (GAN) rely on self-supervised learning. In order for a model to be able to make predictions, it must be fed a massive amount of text in self-supervised learning. For instance, certain models can forecast the conclusion of a phrase from just a few words. These text models become highly accurate when one considers the Internet as a vast supply of text input data. When the model is trained utilizing almost the whole internet, there is a large expense associated. Although the precise expenses have not been disclosed by OpenAI, experts estimate that GPT-3 was trained on approximately 45 terabytes of text material, or one million feet of bookshelf space, at a cost of several million dollars.

Machine Learning falls within the broader domain of Artificial Intelligence, utilizing statistical models to analyze and forecast data. Deep learning, on the other hand, constitutes a subset of machine learning algorithms characterized by the utilization of multiple layers to iteratively extract increasingly complex features from raw input. With advancement in deep learning, discriminative models from neural networks were typically used for image classification, NLP, and speech recognition. Variational autoencoder and generative adversarial network produced the first practical generative deep neural network. This was capable of outputting the entire image.

Based on the training data, generative AI is a collection of algorithms that can produce obviously fresh and reasonable content, such as text, drawings, photos, videos, or sounds. The building blocks of generative AI algorithms are foundation models. To find underlying patterns for a wide range of tasks, the foundation models are trained in a self-supervised manner on massive amounts of unlabeled data. You can use GPT-3.5, a foundation model trained

on a lot of text, for sentiment analysis, text summarization, and question answering. A multimodal (text-to-image) foundation model called DALL-E can be modified to produce new images, enlarge old images, or generate new versions of paintings. Giants in the IT infrastructure space like Microsoft and Google have created APIs that allow developers from other companies to use LLMs. They can now incorporate ChatGPT's power into their systems.

3. Type of Generative AI models -

Text models:

i. An autoregressive model pretrained on a sizable corpus of text, **GPT-3, or Generative Pretrained Transformer 3**, produces high-quality natural language text. Flexible in nature, GPT-3 can be adjusted to perform a wide range of language tasks, including question-answering, summarization, and language translation.

ii. Similar to GPT, **LaMDA, or Language Model for Dialogue Applications**, is a transformer language model that has been pre-trained to produce natural language text of excellent quality. On the other hand, LaMDA was trained on dialogue with the intention of detecting subtleties in free-form discussions.

iii. With the aim of being as performant as GPT-4 and LaMDA, **LLaMA** is a smaller natural language processing model. LLaMA is trained on more tokens in order to achieve better performance with fewer parameters, even though it is also an autoregressive language model based on transformers.

Multimodal models -

i. The most recent model in the GPT family, **GPT-4** is a large-scale, multimodal model that can generate text outputs in addition to accepting image and text inputs. The GPT-4 transformer-based model is pretrained to predict the next token in a document. Improvements in performance on tests of factual accuracy and adherence to intended behaviour are the result of post-training alignment.

ii. **DALL-E** is a kind of multimodal algorithm that can work with various data modalities and use text input in natural language to produce original artwork or images.

iii. Similar to DALL-E, **Stable Diffusion** is a text-to-image model that gradually reduces image noise until it matches the text description through a process known as "diffusion."

iv. Using natural language text input, Progen is a multimodal model that has been trained on 280 million protein samples to produce proteins with the desired properties specified.

4. Generative AI has potential to transform customer service

Generative AI is considered a game changer for organizations as it can accelerate AI adoption despite low AI maturity. Generative models still need to be significantly customized, which takes experience. With comparatively little data, it is possible to implement a generative model for a given task. Generative AI outputs can be broadly categorized as -

i. Content generation - Creation of unique outputs such as video for ad campaign, protein with antimicrobial properties

ii. Productivity improvement - Facilitating manual or repetitive tasks, such as writing emails, or coding

iii. Personalization - Producing information and content with a target audience in mind, such as marketing campaigns based on behavioural patterns in a particular clientele

In the upcoming years, generative AI technology is expected to drastically disrupt various industries and potentially serve as a catalyst for resolving some of the most difficult issues confronting the modern world. In the past few years automation technologies (like IVR, RPA, chatbots) have tried to transform Customer Service operations. Organizations have apprehensions in implementing automation solutions for customer service as bot-to-human interactions were found frustrating by customers.

This was a valid concern with inconvenient, rules-based first-generation bots. Also, any savings from automated tasks needed were compensated to educate customers to use automation services.

Ever since Open AI introduced ChatGPT approximately a year ago, businesses across all sectors are investigating the potential benefits of generative AI. Post launch of ChatGPT, the general public users has started leveraging Generative AI capabilities and is excited for ChatGPT's responses.

Generative AI is an ideal technological solution for customer service operations due to its broad user base and quick adoption. Customer care systems with generative AI capabilities can reply to inquiries from clients quickly, offer personalized recommendations, and create text, images, and other types of content for social media. Using generative AI in a customer-facing environment is a perfect fit because of its advanced ability to communicate with human users in an easy and natural way. Generic artificial intelligence (AI) can offer quicker, more efficient support, ranging from enhancing the conversational experience to helping agents with suggested responses.

A BCG report claims that, once widely used, generative AI solutions in customer service could boost output by as much as 30% to 50%. In the next three years, the majority of global customer service leaders anticipate using AI bots to assist their customers at some point during their customer service interaction journey. Businesses wishing to integrate generative AI solutions into their customer support operations must identify the use cases that will maximize benefits and minimize risks.

5. Generative AI application in Customer Service

The LLM models of generative AI are trained on massive amounts of data and are capable of quickly and accurately recognizing, classifying, and producing complex text and speech. An increasing percentage of customers, according to customer experience research firms, would rather use self-service platforms than speak with agents in contact centers. Organizations can optimize

operational costs and enhance customer experience by integrating this trend with Generative AI solutions into their core customer services operations. Below are potential ways in which Generative AI can transform customer services.

i. **New ways to discover custom information**- Generative AI is now able to be used by chatbots to address customer inquiries, fix problems, and even make recommendations for goods or services. One of the most widely used travel websites and apps worldwide, Expedia, has included conversational AI support powered by ChatGPT into its offerings. This implies that clients can arrange their trips as though they are conversing with an approachable, competent travel agent, as opposed to looking for flights, lodging, or destinations. To help with planning, the app also automatically generates smart lists of the lodgings and attractions that the user is interested in. AI and ML are employed to offer customized and relevant travel choices by considering a vast array of 1.26 quadrillion variables. These variables encompass factors like hotel location, room type, date ranges, price points, and various other parameters, ultimately aiding travelers in their decision-making process. With time, this digital front line will provide service with the same considerate empathy as front lines staffed by people. Like the best employees have always done, generative AI applications will interact with consumers and learn to present pertinent products and information.

ii. **High-quality, personalized engagement**- Generative AI has applications outside of contact centers. Organizations use it extensively to learn more about the preferences of their customers and then provide tailored recommendations. Digital assistants with generative AI are assisting staff members in fortifying their relationships with customers, highlighting the areas in which a human touch could be a source of uniqueness. For example, Morgan Stanley Wealth Management is introducing an AI assistant to support its thousands of financial advisers in providing more individualized client care. Financial advisors have rapid access to the bank's repository of

knowledge, referred to as the "intellectual capital," comprising approximately 100,000 research reports and documents. This is facilitated through a tool called the AI @ Morgan Stanley Assistant. The assistant frees up advisors' and customer service representatives' time by answering inquiries about markets, suggestions, and internal procedures. This allows the advisors to interact with clients more. The upcoming wave of cases would include real-time script recommendations for relationship managers or predictive routing of a customer's inquiry to the agent most qualified to handle a specific issue. Agents can use the technology to determine whether their interactions are creating promoters or detractors by having it listen to a customer call in real time.

iii. **High customer satisfaction at lower operational cost**- In order to facilitate the updating of knowledge articles by customer service agents—who frequently manage multiple cases at once—generative AI can analyze data from customer interactions to recommend thorough case summaries. This allows the organization to learn from past interactions and enhance its customer service. ChatGPT has been incorporated by UK-based energy provider Octopus Energy into its customer support channels. Currently, it is in charge of 44 percent of client enquiries. Teams can now write comprehensive and detailed email responses more quickly thanks to customer service platforms driven by generative AI. When compared to email responses created solely by humans, the company claims that emails written by the AI application produced customer happiness scores that were 18% higher. A third of all customer inquiries are already addressed by the application, freeing up agents to assist with more complicated, rapidly expanding products like home electricity generation and electric vehicles. According to CEO Greg Jackson, the app now performs the tasks of 250 employees and outperforms human customer support representatives in terms of customer satisfaction ratings.

6. Roadmap for Generative AI journey

AI in customer service is not a futuristic concept and has been playing a pivotal role in transforming how organizations are engaging with customers. AI-enabled customer service is evolving as a journey of interest, enablement, and customization, through five levels of maturity. At level 1, the simplest of transactions which are manual and high touch point are made self-service for customers. Interactions are served as reactive responses on human-assisted channels, apps or online portals. At level 2, simple journeys are served through partly automated and basic digital channels. Channels are enabled with basic chatbots, integrated natural language voice response and robotic process automation. It is observed that lower adoption of available self-service channels. At level 3, complex journeys with focus on end-to-end resolution are served by digital channels augmented by humanlike voice bots and chatbots. Channels are powered by AI to provide somewhat proactive but limited engagement. At level 4, most journeys are served by proactive conversational user experience. Seventy to eighty percent of interactions are handled by self-service channels, which include mobile product apps, IVR systems, social media, and websites. These channels are also capable of handling most customer requests and inquiries. Bots are made specifically for clients and are just like humans. AI will be capable of answering the majority of consumer questions. Companies will move from answering questions to proactively resolving issues for clients, greatly enhancing the client experience. AI-enabled personal assistants will interact with clients directly, providing proactive fixes for typical issues before they arise. At level 5, Customer centric, digitally powered engagement, bringing the human element by predicting the intent. Customer service interactions that anticipate needs, resolve issues, and provide recommendations tailored to each individual customer are what motivate engagement. Through improved product and service cross-selling and upselling, digital touchpoints promote service-based engagement. Customers view service bots as their personal assistants. These bots interact with other company systems to build a complete picture of the customer life cycle, and they are fully aware of the relationship that customers have with the company. They can also predict the needs and concerns of customers.

An organization should implement AI-powered customer services when it observes a rise in the number of complaints, protracted resolution times, rising costs of service, and low adoption of self-service channels. Firstly, revamp existing channels and improve straight-forward operations in self-service options. Secondly, explore possibility to launch new, dedicated digital and social-media channels. Thirdly, enable service channels with AI systems to recognise intent and automate resolution. Real-time tracking of performance against service level agreements and customer engagement goals is made possible by digitally enabled measurement techniques. APIs power the underlying technology stack, which can be expanded to include features like behavioral analytics and next-best-action solutions. Ultimately, an integrated operating model is used to develop and maintain the redesigned customer service function. The model functions as a capability-building tool by bringing together leaders in business, services, and products.

A McKinsey report estimates that 75% of customers use multiple channels during their continuous interaction. Therefore, all touchpoints must be covered by AI-supported customer care. AI-enabled tasks go beyond simple automation. AI also supports human-driven service lines on social media platforms and in branches, enabling human agents to provide efficient and high-quality results in real time. Examine a customer who has an unusually high medical bill in order to gain a better understanding of a potential use case. With the aid of artificial intelligence, a system can predict user intent, highlight minimum balance requirements for credit cards, and recommend payment plan options. Because the agent is able to provide tailored recommendations in addition to solving the current issue, this improves customer retention.

Digital maturity has advanced significantly for businesses in industries like over-the-top (OTT) media services, taxi aggregation, and e-commerce. Within the traditional direct-to-consumer industries, such as BFSI, telecommunications & media, and healthcare, very few companies have reached levels three and four of growth. The most developed companies are starting to work their way up to level five. In order to facilitate proactive and

customized customer engagement through self-serve channels, updated apps, improved user interfaces, real-time interactive voice response (IVR), and chat, these companies are developing AI-enabled customer service solutions. While generative AI delivers prompts and messages to customers in a non-intrusive, human-like, and customized way, traditional AI methods rely on the messages to be delivered and the prompts to be driven. It's clear that businesses start to envision what a customer service department run entirely by AI could look like. As AI gains more traction and becomes more accurate and bias-free in its trained actions, human supervision of AI-enabled customer contact will become much less necessary.

7. Challenges with Generative AI

The customer behavior has also changed in recent years which make it more challenging for AI to incorporate scenarios to serve requests right. For more complex needs, customers are increasingly using contact centers and assisted-chat features. Customer have gained fair bit of confidence in self services channels for transactional use cases Hence, they are expecting similar level of outcomes for more complex use cases

There are still some intricacies in generative AI, and it is still developing. The vast amounts of data that generative AI is trained on are what give it its amazing performance. However, using a dataset this large and unrestricted can cause problems with accuracy. Generative AI models use their training data to provide their best estimate in response to prompts, depending on what you ask them to do. Unfortunately, there are times when these estimates may not account for facts.

Large datasets are needed for the training of generative AI systems. This makes it difficult to maintain technically and in terms of resources.

In the context of customer services, issues in Generative AI can pose great threat to the advantages that business can draw from Generative AI.

Falsehoods in facts in Generative AI outputs, where highly confident responses to customers' queries may not be accurate. Generative AI solutions can have inherent biases in the data on which the foundational model was trained. Furthermore, these biases may result in the unfair treatment of some customers when models are fine-tuned based on particular contexts.

Basic hygiene steps can be very effective to overcome these challenges like optimize training data for Generative AI models. The knowledge base in a customer support system will be linked to the generative AI model as its training data. As a result, it becomes crucial to update the knowledge base with only the most recent and pertinent information while deleting outdated or redundant articles.

Keeping a human touch in the process is the best way to overcome these obstacles. Before AI-generated content reaches a consumer, a human review is required. The kind of customer interaction will determine whether a human check is required. Generative AI solutions are highly capable of handling certain simple, transactional interactions. High-value exchanges and premium services, however, will call for direct human supervision. By developing hybrid tools that combine the accuracy of traditional tools with the human-like intimacy of Generative AI, some organizations are investigating ways to lower the risk of error. These tools combine a mix of LLMs and more conventional AI and automation technology.

Training data will become more relevant, high-quality, and secure as generative AI applications in customer service develop. Businesses will become more confident in the capabilities of generative AI solutions, lowering the need for human supervision and enabling direct customer interaction. Businesses will become more adept at removing bias and inaccuracies and identifying particular use cases for AI. Regardless of the level of AI maturity attained, organizations must make sure that as technology advances, it retains the human touch and empathy necessary to be effective in the customer care context.

8. Conclusion

In order to keep customers and their engagement at the core of their vision for the future of customer service, businesses must define the strategic value to be realized. In light of the increasing convergence of AI and service channels, organizations need to reevaluate every customer touchpoint, whether digital or assisted, as well as opportunities to enhance the experience while also boosting efficiencies. Businesses may make the most of every interaction to build stronger relationships with customers, encourage loyalty, and raise lifetime value with the aid of customer service. Give employees and consumers a more proactive, personalized customer care experience that encourages self-service and decision-making by leveraging AI and an end-to-end technology stack.

Large customer service departments that currently deal with clients separately from the rest of the company will soon give way to agile, data-driven companies that collaborate closely with other departments to deliver genuinely unique client experiences. Generative AI systems will probably be able to anticipate consumer behaviour and connect with them before they know what they need or want as they gain more knowledge about a business's offerings, processes, and clientele.

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About the Authors:

Neha Sadhotra is an Assistant Professor of Marketing and Program Chairperson, MBA HealthCare Management in the School of Business Management, SVKM's Narsee Monjee Institute of Management Studies (NMIMS), Mumbai campus. She is a Fellow in Marketing from IIM Lucknow with over 4 years of Management teaching experience. She has worked as a consultant for Coir Board- India, Ministry of MSME, Govt. of India and Pawan Hans Ltd. She is the recipient of the Liam Glynn Research Award by Center for Services Leadership, Arizona State University. Her research interests lie in the domain of HealthCare Service Excellence, Service robotics, Service Innovation, and Consumer adoption of technology. In Executive education, she has delivered learning and development initiatives for Mid-Level Sales and Marketing leaders across different sectors. Her recent engagements have been with Marketing Teams from Bayer Pharma, Dr Reddy's Laboratories Ltd., GSK, Larsen & Toubro, VFS, APOTEX, Elecon, Everest, etc. Dr. Neha Sadhotra can be contacted at neha.sadhotra@sbm.nmims.edu.

Nimish Gupta presently serves as the Data and Analytics Director at BCG X, bringing to the role over 16 years of extensive experience in analytics. His professional journey has been marked by successful collaborations with client organisations across diverse sectors such as Consumer Packaged Goods (CPG), Customer Service, Industrial Goods, and Healthcare. In these collaborations, he has played a pivotal role in conceiving and implementing enterprise-level analytics solutions. Gupta's passion lies in the democratization of data-driven decision-making across various business functions, a commitment that underscores his belief in the transformative power of analytics. His strategic acumen and dedication to advancing data-driven practices have consistently contributed to the success of organizations under his purview. Nimish Gupta holds a degree in Mechanical Engineering from Jabalpur Engineering College and is a Post Graduate from the Indian Institute of Management, Lucknow. This educational background, coupled with his extensive professional experience, positions him as a seasoned leader in the field of data and analytics, adept at steering organizations towards informed and data-centric strategies.

THE FUTURE OF BUSINESS IN THE METAVERSE

Brinda Sampat

Information Systems and Analytics,
NMIMS Global Access School for Continuing Education
SVKM's Narsee Monjee Institute of Management Studies (NMIMS)
Deemed-to-be-University, Mumbai, India
E-mail: brinda.sampat@nmims.edu

Abstract: This chapter presents the transformative impact of the different technologies comprising the Metaverse and the opportunities and associated challenges it presents. This parallel universe, which intertwines the physical and digital world, is examined through the lenses of Virtual Reality (VR), Augmented Reality (AR), Blockchain, and Artificial Intelligence (AI). These technologies are pivotal in creating immersive experiences, secure digital asset ownership and lifelike interactions within the metaverse. The chapter delves into the opportunities arising from the metaverse in different organizational areas, including virtual commerce, supply chain management, tourism, healthcare, and marketing. The metaverse poses challenges, including privacy and data security concerns, ethical considerations, access and inclusivity, and legal and regulatory issues. It is imperative to balance the different opportunities the metaverse brings in and its challenges for an inclusive metaverse future.

Keywords: Metaverse, Augmented Reality, Virtual Reality, immersive experience, business, data privacy

1. Introduction

The metaverse is the next generation of Internet evolution that uses blockchain technology, virtual reality headgear and avatars to combine the real and virtual worlds (Dwivedi et al., 2022). A seamless network of interconnected virtual worlds can significantly alter how consumers, brands, and businesses conduct business and communicate (Giang Barrera & Shah, 2023). Metaverse has gone beyond several discussions in sci-fi movies to find itself predominantly being discussed in tech forums and business meetings (Koohang et al., 2023). Metaverse is a parallel digital world linked with the physical world, fostering social interactions, virtual commerce, gaming and work. With technological progress, several businesses are investing in being "metaverse-ready" as they foresee the implications of using metaverse. Neal Stephenson coined Metaverse in his 1992 science fiction novel "Snow Crash", wherein a digital environment was described with the use of augmented reality, virtual reality and mixed reality (Joshua, 2017; Stephenson, 1992). It is a space where individuals can interact with each other and digital objects, creating a equivalent universe. The metaverse is constantly evolving as it merges the physical and digital spaces. This chapter embarks on a journey to explore the Metaverse technologies, business opportunities, challenges, and future trends that are poised to reshape the business landscape.

2. Metaverse Technologies

2.1. Virtual Reality (VR) and Augmented Reality (AR)

Virtual Reality (VR) and Augmented Reality (AR) are the two fundamental technologies that are pivotal in shaping the metaverse, blurring the lines between the real and the virtual world. VR engages the users by completely immersing them in the virtual world, which is instrumental for gaming, education and social interaction (Dincelli & Yayla, 2022). On the contrary, AR superimposes objects from the digital world into the real world, blurring the lines between the digital and real world through devices such as AR glasses or smartphones. AR and VR create an exclusive and immersive experience, playing a critical role in the metaverse.

2.2. Blockchain and NFTs in the Metaverse

The blockchain technology and Non-Fungible Tokens (NFTs) have transformed the metaverse offering secure, transparent, and digital asset ownership. Blockchains provide metaverse with identity, property rights trust in virtual transactions and authenticity. These technologies provide for users to perform transactions such as sell artwork, trade virtual land etc. using NFTs and digital tokens. This gives virtual things a layer of scarcity and provenance (Gadekallu et al., 2022). These technologies enable users and producers to profit from their digital works while granting them full ownership and copyright protection. Blockchains and NFTs enable a new economy in the metaverse that promotes collectables, creativity, and decentralized ecosystems.

2.3. Artificial Intelligence

Artificial intelligence (AI) and machine learning (ML) are essential for creating lifelike avatars, intelligent NPCs (non-player characters), and personalized experiences within the Metaverse.

These are indispensable in the metaverse, enhancing user experiences and functionality. AI-driven avatars and characters make interactions more lifelike, adapting responses to user behaviour. ML algorithms enable predictive analytics for personalizing content and immersive environments, tailoring experiences to individual preferences (Dwivedi et al., 2022). AI-powered chatbots and virtual assistants improve user support and engagement within the metaverse. Additionally, AI and ML are instrumental in content creation, generating procedural worlds, and fine-tuning gameplay mechanics. They also monitor and moderate user-generated content, ensuring a safe and inclusive metaverse environment. AI and ML enrich, automate, and optimize the virtual experience in the metaverse. The following section describes the business opportunities in using the metaverse.

3. Business opportunities in the Metaverse

Businesses stand to gain significantly by embracing the metaverse, a burgeoning digital frontier where the physical and virtual worlds merge. The

metaverse offers many opportunities that can drive innovation, growth, and engagement across various sectors. The metaverse transcends geographical limitations, enabling businesses to reach a global audience. Metaverse provides opportunities for small organizations to compete with industry giants, attracting customers and marketing campaigns within the metaverse. Metaverse allows to place advertisements, sell virtual products in virtual spaces, gamify efforts to attract users and presents several monetization prospects using NFTs (Non-Fungible Tokens) and virtual currencies.

The metaverse provides business the opportunity to improve customer experience, loyalty and engagement. The user data collected can be used to provide personalized experience to customers in the form of avatars and AI-driven assistance. This wealth of data provides data for new product development and decision-making. Metaverse lends opportunities to encourage companies to adapt to changing digital landscape by foster innovation. This can be achieved by working on projects in virtual spaces. As organizations move towards achieving sustainable goals and environment development, they aim at reducing their carbon footprint by promoting telecommunication, remote and hybrid work options within the metaverse. Organizations can use Augmented Reality (AR) to enhance real-world experience projecting content within physical locations. This section provides insights into the applications of metaverse in the business context, namely virtual commerce, Supply Chain Management (SCM), virtual tourism, healthcare, advertising, and marketing.

4. Metaverse across Business Domains

The Metaverse engages customers by using novel methods to pave a way for innovation and growth, which often calls for organizations to align their operations and customer acquisition strategies.

4.1 Virtual Commerce and Metaverse

Immersive virtual storefronts in the metaverse provide dynamic shopping experience leading to improved customer engagement. Shopping, communicating, and exploring products will be revolutionized Virtual commerce in the metaverse will be a complex, immersive, and networked

experience that completely changes how we interact, purchase, and deal with goods and services. In metaverse environments, companies will set up digital stores where consumers can peruse merchandise in an engaging and visually stimulating three-dimensional environment. These shops might be anything from large malls to online boutiques.

Customers will use avatars to interact with products, browse virtual stores, and even virtually try items on. This gives the shopping experience a sense of realism (Sun et al., 2023). Blockchain-powered virtual currencies will probably make it easier to exchange for both virtual and tangible items. Payments will be made easier via tokens unique to the metaverse or cryptocurrencies. Customers get detailed access to see and engage with products. For example, they can examine an item of clothing's detailing, experiment with virtual technology, or see how furniture fits into their virtual living areas. AI and data analytics will personalize shopping experiences. The metaverse will use user data to make personalized product, style, and service recommendations based on user behaviour and preferences.

Users can recreate the social aspects of buying by shopping with friends or interacting in real-time with virtual sales staff. The ownership of tangible and digital assets will be represented by non-fungible tokens (NFTs), enabling users to exchange and amass rare objects inside the metaverse. Metaverse marketplaces will facilitate the easy buying, selling, and trading of various goods, including virtual real estate and digital art. Companies can produce limited edition items aimed at collectors and virtual goods available only in the metaverse (Jeong et al., 2022).

Blockchain technology will guarantee product authenticity, lowering the possibility of fake goods. Smart contracts will make trustless, safe transactions easy. Within the metaverse, businesses can use immersive, gamified, and interactive marketing techniques to attract customers and advertise their goods. Firms will require effective metaverse supply networks in the background to transport virtual goods and handle inventory. Content

producers can generate additional income by directly selling their works in the metaverse, including virtual collectables, art, and fashion.

4.2 Supply Chain Management and Metaverse

The metaverse will cause a change in the physical-digital environment by making it possible to simulate the supply chain's physical phases in a digital setting (Fantini et al., 2020). Every technology included in the metaverse will have the ability to alter the way supply chains are managed. With blockchain technology in the metaverse, supply networks can become more reliable, transparent, safe, effective, moral, and robust (Babich & Hilary, 2020). The downstream processes can be represented and simulated using augmented and virtual reality. In addition, it can provide enhanced supply chain transparency by displaying lead times and delays in the logistics process together with the shipment data (Rodríguez-Espíndola et al., 2020).

Supply chains in the metaverse can have more collaborations, customer interactions, and intelligent products, leading to automatic replenishment and better routing and customer experience (Scaff, 2022). With less travel to vendor locations, smart contracts can improve interactions with the vendor network and deliver better products faster and more effectively (Dolgui et al., 2020). The end-to-end supply chain network may be mapped using metaverse, improving the visibility of all supply chain phases. This lets us provide real-time, accurate information on logistics costs, delivery delays, and product lead times. A virtual version of the manufacturing facility, cargo ship, warehouse or distribution centre can be used to design efficient facilities, which help process peak loading periods or disruption time (Maersk, 2022). The testing performed on these simulations can pave the way for actual implementation.

4.3 Tourism and Metaverse

Virtual tourism in the metaverse is set to be a transformative experience, redefining how people explore destinations and interact with the world (Buhalis et al., 2023). Travellers can access virtual versions of popular tourist spots, historical landmarks, or entirely imagined worlds. Virtual tourism agencies and platforms can curate these experiences. Virtual tour guides provide informative and entertaining guided tours, whether AI-driven or

human-led avatars. Tourism companies and individuals can lead virtual tours, offering insights, historical context, and stories about the places users visit within the metaverse. Virtual tourism allows users to engage with different cultures and historical eras (Go & Kang, 2023). Providers can offer immersive cultural experiences, like cooking classes, language lessons, or visits to historical events, making it a valuable educational tool. Users can interact with virtual environments, objects, and NPCs (non-player characters) in metaverse destinations. Tourism companies can create engaging and interactive scenarios, encouraging exploration and participation, like a video game focused on education and discovery. Users can "stay" in virtual hotels, resorts, or even fantasy-themed accommodations. Hospitality businesses can offer immersive lodging experiences with unique, customizable virtual rooms and accommodations for travellers. Virtual tourism enables participation in events and festivals held within the metaverse. Event organizers can host digital renditions of their celebrations, attracting a global audience without physical attendance limitations. Virtual travel agencies within the metaverse can assist users with trip planning, bookings, and itinerary creation. Businesses can operate metaverse-exclusive travel agencies, offering a one-stop solution for users to plan virtual and real-world trips. Augmented reality (AR) can complement virtual tourism by overlaying information and enhancing real-world surroundings. AR apps and wearables can provide real-time data and historical context while users explore physical locations during their travels. The metaverse can serve as a forum for bringing up sustainability and environmental issues. Travel agencies and ecotourism providers can use the metaverse to involve customers in immersive and informative sustainability programmes.

4.4 Healthcare and Metaverse

The metaverse promises to transform the healthcare sector by offering telemedicine, which enabled to treat patients during the COVID-19 pandemic. The metaverse provides for virtual clinics, immersive medical avatar consultation, real-time vital stats data sharing, and virtual hospital visits to obtain advice from medical experts. This can give a more thorough approach to healthcare delivery and greatly enhance the patient experience.

On the other hand, metaverse provides opportunities for improved medical training and education whereby students can practise surgical operations and diagnostic methods in a virtual environment using realistic, hands-on simulations. These immersive learning opportunities can better educate aspiring healthcare professionals by offering a secure environment where mistakes may be made and lessons learned from them. Experts and practitioners can more easily share knowledge and stay updated on the most recent advancements in their disciplines by holding medical conferences and training sessions in the metaverse.

The metaverse also holds promise for medical research. Researchers can analyze complex medical data more efficiently with vast computing power and data visualization tools. Drug discovery, genetics research, and clinical trials can benefit from this advanced technology, accelerating breakthroughs and medical innovation. Collaborative efforts can be strengthened as experts worldwide come together within the metaverse to tackle global health challenges.

In addition, the metaverse can significantly impact the mental health sector. Healthcare providers can use virtual reality (VR) experiences to treat conditions such as anxiety, phobias, and post-traumatic stress disorder. Patients can immerse themselves in therapeutic environments that promote relaxation and healing. This offers alternative, non-pharmacological treatment options and improves the overall patient experience during medical procedures and therapies. However, integrating the metaverse into healthcare also raises several concerns. Data privacy and security are paramount, as the metaverse requires collecting and sharing sensitive patient information. Ensuring medical data security and compliance with regulations is a critical challenge.

4.5 Marketing and Metaverse

The metaverse is redefining advertising and marketing by offering consumers immersive, interactive, and personalized experiences. In this virtual realm, traditional advertising methods give way to innovative approaches that

captivate audiences. Businesses can engage users through product placements in virtual environments, allowing customers to interact with items before purchase. Gamified marketing campaigns, quizzes, and scavenger hunts within the metaverse make brand engagement a playful adventure. Moreover, AI-driven avatars and virtual influencers can offer tailored product recommendations, making shopping experiences highly personalized. The metaverse also brings an element of authenticity as users interact in virtual showrooms and try on virtual clothes before making buying decisions. While the opportunities are immense, ethical considerations and data privacy become pivotal, requiring businesses to ensure transparency and consent in collecting user data. As the metaverse continues to evolve, advertising and marketing within this digital realm will play a central role in shaping brand-consumer relationships, offering unique ways for companies to connect with their target audience in a dynamic, innovative, and highly engaging manner.

5. Challenges and Concerns in using metaverse in business

5.1 Privacy and Data Security

The Metaverse raises critical questions about data privacy and security. Users, businesses, and regulators must grapple with these challenges. Privacy and data security in the metaverse are paramount concerns. As users immerse themselves in this digital realm, the potential for data exposure and misuse is significant. Protecting sensitive information, such as personal identities and financial data, becomes essential. Implementing robust encryption, user authentication, and strict data access controls is imperative (Zhao et al., 2022). Blockchain technology may be vital in ensuring data integrity and user consent. Striking the right balance between a seamless metaverse experience and safeguarding personal data is a challenge that businesses and developers must address to build trust and protect user privacy within this emerging digital landscape.

5.2 Ethical Considerations

As digital experiences in the Metaverse become more lifelike, ethical questions arise regarding identity, behaviour, and responsibility. Key ethical concerns

include digital addiction, online harassment, virtual property rights, and consent for data use. Businesses and developers must prioritize user well-being, digital inclusivity, and diversity. Ethical content creation and moderation are pivotal, as is respecting cultural and social norms within virtual spaces (Kaddoura & Husseiny, 2023). Balancing technological innovation with ethical values is vital to creating a metaverse that fosters positive experiences, encourages responsible behaviour, and upholds the rights and dignity of all participants.

5.3 Access and Inclusivity

Access and inclusivity are critical considerations in the metaverse. Ensuring that the virtual world is accessible to everyone, regardless of physical abilities or technological limitations, is a fundamental ethical imperative. In order to prevent discrimination, exclusion and promote diversity, metaverse designers should accommodate experiences for people with impairments, provide different device options based on the kind of disability and access to multiple points. This inclusivity enables people from different walks of life to engage, learn and participate fully eliminating any physical barriers by fostering a sense of community.

5.4 Legal and Regulatory Issues

There are several legal and regulatory challenges posed by the metaverse. In order to gain a competitive advantage organization need to focus on the ethical responsibility of prioritizing inclusivity and access. Companies focus on tapping into engaging customers from diverse backgrounds to foster a positive brand image thereby strengthening customer loyalty. Legal aspects on determining the owner of virtual land, assets can be challenging in the metaverse. Likewise, privacy and security concerns such as preventing identity theft, virtual theft, harassment need to be considered. Focussing on equitable access and preventing the concentration of power in one hand needs to be avoided.

6. Conclusion

The metaverse unleashes different opportunities for businesses by incorporating emerging technologies and trends, which will redefine the

future of business. With using the metaverse, businesses can create new dynamic user-centric avenues in the digital realm. The discussion of the application of the metaverse across business domains in this chapter further cements this.

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About the Author:

Brinda Sampat is an Assistant Professor at the NMIMS Global Access School for Continuing Education, NMIMS University, Mumbai, India. Her research interests are at the interface of Information Systems and Marketing Management, which primarily focuses on consumer adoption and diffusion of emerging technologies (AI, mobile health, wearable devices, social media) and digital innovations through the lens of emerging economies. She has published articles in reputed journals such as the Journal of Enterprise Information Management, Annals of Operations Research, Personnel Review, AIS- Transactions of Human-Computer Interaction. She can be contacted at brinda.sampat@nmims.edu.

ONDC: DIGITAL PUBLIC INFRASTRUCTURE

Sudhanshu Pani

Finance, School of Business Management
SVKM's Narsee Monjee Institute of Management Studies
(NMIMS) Deemed-to-be-University, Mumbai, Maharashtra, India
E-mail: sudhanshu.pani@sbm.nmims.edu

Abstract:

This chapter explores the role of India's Open Network for Digital Commerce (ONDC) as an emerging case study in digital public infrastructure. It delves into the significance of ONDC, its components, the benefits it brings to modern society, and the challenges it faces. Through the ONDC case study, we gain valuable insights into the transformative potential of digital public infrastructure in e-commerce and public service delivery.

Keywords: ONDC, Digital public Infrastructure, digital commerce, decentralized networks

1. Introduction

According to Zuckerman (2020), infrastructure could be physical, digital and social. In the realm of infrastructure, encompassing physical, digital, and social dimensions, digital infrastructure has risen as a critical driver of modern economies. This chapter embarks on an exploration of India's Open Network for Digital Commerce (ONDC), shedding light on its role as an emerging case study in the domain of digital public infrastructure. To grasp the transformative potential of ONDC, it is essential to understand the constituents and significance of digital infrastructure within the broader

context. Here, we will delve into ONDC's components, the benefits it offers to contemporary society, and the notable challenges it confronts. By analyzing the ONDC case study, we can glean valuable insights into the dynamic landscape of digital public infrastructure and its profound impact on e-commerce and public service delivery. In several ways, ONDC is a counterintuitive application of digital public infrastructure necessitated by the implicit breakdown of market forces. The primary rationale of ONDC is to restore equity in access to advancement in digital technology-led commerce to small and medium enterprises. Let's begin this journey by first examining the key constituents of digital infrastructure and the origins of its development.

The widely identified constituents of digital infrastructure in an economy include Identity, Internet, Communication, Platforms, Payments, and Banking. The constituents of digital infrastructure may be developed in the public sector, private sector or through a partnership between the public and private sector. Since the dawn of the internet, it was expected to be driven by private enterprise and far from the control of governments.

1.1 Understanding Digital Public Infrastructure
India is a leader in the use of digital technology, alongside nations like Brazil, China, Finland, Estonia, and others. It has experienced success with massive population-scale digital infrastructure, namely, AADHAAR (a digital Identity), Jan Dhan Yojana (zero balance bank accounts) and UPI (Unified payment interface). The project under active implementation, ONDC, is expected to facilitate e-commerce adoption and give a fillip to the growth of startups by providing an ecosystem of collaboration.

G20 leaders' declaration 2023[1] envisages the use of digital public infrastructure for inclusive and sustainable development. The vision is to have "a set of shared digital systems, built and leveraged by both the public and private sectors, based on secure and resilient infrastructure, and can be built

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[1] https://www.g20.org/content/dam/gtwenty/gtwenty_new/document/G20-New-Delhi-Leaders-Declaration.pdf

on open standards and specifications, as well as opensource software can enable the delivery of services at societal-scale."

Digital Public Infrastructure

The UNDP considers digital public infrastructure as an essential part of digital transformation. UNDP[2] has observed a consensus around the following features of digital public infrastructure:

1. DPI is networked open technology standards built for the public interest.
2. It enables improving governance.
3. It is led by a community of competitive market players working to drive innovation in public programmes.

Some of the population-scale technology solutions that UNDP is working to roll out across the world include

- Iverify (an AI-powered information platform),
- OpenG2P (government-to-person platform),
- UN Biodiversity lab (global data and analytics on people and planet),
- Social Protection (G2P payment solutions),
- Health Emergencies (Indian health focused DPI CoWIN implementation),
- Crisis Response (interoperable cash transfer system).

A widely cited example of DPI is the experience from Estonia and the lessons offered by the implementation in that country.

The Estonian Model for Digital Public Infrastructure1

Estonia offers a compelling example of the foundational principles on which to build a government platform-based digital public infrastructure. As noted by Eaves et al. (2019), the essence of a platform-government model lies in the government's provision of access to canonical databases and shared applications. These resources can be harnessed by various segments of the

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[2] https://www.undp.org/digital/digital-public-infrastructure

government, civil society, and the private sector to address public issues. In Estonia, this vision is realised through a unique framework.

In Estonia, a pivotal element of their digital public infrastructure is a national individual identification layer, complemented by the X-Road communication infrastructure. The X-Road serves as the conduit for transferring information between agency data registries. Should an agency or private enterprise seek to develop a new service, adherence to basic data standards for building atop the X-Road stack is imperative. This approach essentially negates the need for creating a database and application layer from scratch, streamlining the process by focusing solely on the "last mile" to the end-user. The result is the accelerated and efficient development of new services, incorporating valuable citizen input. Moreover, the reduction in initial costs minimizes resistance when it becomes necessary to retire a tool or service.

Estonian experts underscore that digital public infrastructure differs from physical infrastructure. While code can be freely replicated, it must exist within the context of robust governance and daily oversight. Failures in public sector delivery often stem from governance challenges and their inherent complexities rather than faulty code. Everyday maintenance, regular updates, patches, and routine cybersecurity certification audits are essential but sometimes overlooked aspects, neglected by top decision-makers. However, the sustained execution of these business processes evolves consistently, forming the bedrock of digital transformation.

In crafting digital public infrastructure, the guidance is clear: steer away from monolithic systems. Instead, embrace domain-driven, design-based, modular, and reusable microservice architecture. This approach automates routines, reduces dependencies, and minimises reliance on a single vendor or legacy technology. The development process should remain in-house, ensuring autonomy.

For substantial progress in constructing digital public infrastructure, harness the power of a distributed community. This collaborative approach fosters innovation and furthers the project's reach.

Strategically, it is advisable to commence with small, manageable steps, allowing for gradual expansion based on experiential learning and feedback.

A critical principle, and one of efficiency, is to avoid reinventing what already exists. Estonia's digital identity scheme, eID, provides a notable example. Estonia initially adopted the technical aspect from Finland and the legal framework from Germany. Over time, Japan took inspiration from Estonia's model, and Finland, in turn, incorporated components of secure data exchange from Estonia. This strategy saves time and resources, fostering international collaboration in the development of digital public infrastructure.

Other often-cited examples of successful DPI implementation

1. Singapore's Smart Nation initiative[3] : Singapore's Smart Nation initiative is an example of a comprehensive approach to digital public infrastructure. It includes initiatives to improve public services, enhance connectivity, and create a more sustainable and livable city. The initiative includes projects such as the National Digital Identity system, which allows residents to access government services online securely, and the Smart Nation Sensor Platform, which monitors environmental data such as air quality and traffic.

2. Rwanda's e-Government program[4] : Rwanda's e-Government program is an example of how digital public infrastructure can improve government efficiency and service delivery. The program includes initiatives such as the Irembo platform, which allows citizens to access government services online, and the Rwanda Online platform, which provides a centralised system for government employees to manage their work. The program has helped to reduce corruption and improve service delivery in Rwanda.

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[3] https://www.smartnation.gov.sg/
[4] https://www.linkedin.com/pulse/e-rwanda-one-beacons-digital-governments-africa-mohammad-j-sear/

3. South Korea's e-government system[5] : South Korea's e-government system is an example of how digital public infrastructure can improve government transparency and accountability. The system includes initiatives such as the Open Data Portal, which provides citizens with access to government data and information, and the Digital Signature system, which allows citizens to sign documents online securely. The system has helped to improve government efficiency and reduce corruption in South Korea.

4. Estonia's e-Residency program[6] : Estonia's e-Residency program is an example of how digital public infrastructure can create new opportunities for economic growth and innovation. The program allows non-residents to establish and manage a business online in Estonia. The program has attracted entrepreneurs and investors worldwide who have set up more than 25000 firms, helping to create new jobs and stimulate economic growth in Estonia.

2.0 ONDC - The Indian Initiative for DPI in e-commerce

ONDC is a digital public infrastructure for electronic commerce. There exists minimal rationale for the creation of public infrastructure for digital commerce and hence enormous potential for disruption. The rationale offered for the setting up of ONDC suggests a complete breakdown of market forces. We are going into a full circle regarding the approach to infrastructure. There was a time in the 1980s when, led by Thatcherism, the public sector was dismantled and handed over to the private sector in the United Kingdom and several countries around the world. Then, we had various experiments around public-private partnerships. We are back to square one with digital public infrastructure. This section explores the factors driving such changes around the world.

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[5] https://unctad.org/system/files/non-official-document/dtl_eWeek2018p76_KibyoungKim_en.pdf

[6] https://www.e-resident.gov.ee/

The ONDC platform holds the potential to generate fresh opportunities, diminish digital monopolies, and bolster micro, small, and medium-sized businesses, along with small-scale merchants, by facilitating their entry into the online marketplace. This initiative is spearheaded by the Department for Promotion of Industry and Internal Trade (DPIIT), under the aegis of the Ministry of Commerce and Industry. Furthermore, ONDC is keen on integrating established major e-commerce players into its ecosystem.

ONDC was incorporated as a Section 8 company in December 2021. The Quality Council of India and Protean eGov Technologies Limited are the founding members. Several banks and financial institutions have also picked up a stake in promoting ONDC as investors.

2.1 Introduction and Rationale

How do digital markets differ from traditional markets?

In traditional markets, there exists an equilibrium point in terms of market size beyond which the marginal cost of delivering services increases with market size. Digital markets are characterised by increasing returns to scale. i.e, the addition of a marginal new customer does not add to the costs significantly. An unintended consequence is that without technological innovation, firms do not chase profits by entering markets where there is a dominant player. Costs of acquiring new customers go down significantly due to network effects. Networks of existing customers act as a moat. When combined with increasing returns on scale, the winners in digital markets take all the profits.

Failure of market mechanism

The Indian Parliament Standing Committee on Finance, in its 53rd report[7], has dealt with anti-competitive practices by Big Tech companies in India.

The committee acknowledges the importance of proactively identifying and addressing anti-competitive practices before monopolies take root within a

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[7] https://eparlib.nic.in/bitstream/123456789/1464505/1/17_Finance_53.pdf

span of 3-5 years. Their interactions with stakeholders have highlighted three primary concerns:

First, the scale game: Monopolistic entities often leverage their pricing power to extract benefits, including valuable usage data, from consumers. For instance, Google provides free services like Gmail and search but generates value through search-based advertising. Second, the strategy of acquiring emerging winners: Dominant players can hinder dynamic innovation by acquiring smaller competitors or by failing to engage in substantial innovation themselves, as exemplified by Google's acquisitions of Youtube and Facebook's ownership of Whatsapp and Instagram. Third, leveraging dominance in one market to gain a competitive edge in others through bundling, tying, and unfair practices. Additionally, these winners can monopolize essential resources, such as skilled personnel, making it challenging for competitors to compete effectively.

The above analysis is relevant to the American model of private corporation-led digital enterprises. The other successful variant of digital enterprises is represented by the Chinese model, where the government stifles competition, there is development of technology and consumer need is met under the overarching architecture of restriction on democratic values.

The important issues discussed by the parliamentary committee offer the imperative to drive ONDC. These are "Anti-Steering Provisions, Platform Neutrality/ Self-Preferencing, Bundling and Tying, Data Usage, Mergers and Acquisitions, Pricing, Deep Discounting, Exclusive Tie-ups, Search and Ranking Preferencing, Restricting Third-Party Applications, Advertising Policies, and Ex-Ante Restraint"

Anti-Steering Provisions

Both Google's Play Store and Apple's App Store are the major players in this AppStore marketplace, and both have been found to have anti-steering provisions on their platforms. They restrict Apps to use payment platforms of their choice within the Apps. In 2020, the Competition Commission of India

launched an investigation against Alphabet Inc, the parent company of Google.

Platform Neutrality

One of the key infrastructures in digital economy is the digital platforms. For example, in India, e-commerce companies can operate as marketplaces, but India does not allow multi-brand retail with foreign ownership. The major players have routinely flouted this guideline. The role of a marketplace is that of a platform for other businesses to list their products and services to allow interested users to find them and engage in an interaction. Since the platforms also have a suite of products, services, and apps from their group, the risk of self-preferencing is high. Without platform neutrality, where the platform does not have preferred agreements with select individual players in the network, a level playing field cannot be provided.

Bundling / Tying

Bundling or tying forces the consumer to take two largely separated products only because they are from the platform owner. Examples of bundling are food apps forcing restaurants to use their delivery services.

Data Usage

Big Tech companies have demonstrated the major success stories in new technology applications. The success is primarily due to their monopolistic control over data. Any firm with access to and control of consumer databases, their activity and business information can push out competitors. Platforms have been collecting, and storing large amounts of data and exploiting it through analytics and algorithms. It needs to be made clear to what extent consumers and businesses are profiled. The rumours of extensive profiling by state entities who have access to such data are coming in from Chinese markets.

Nevertheless, it still needs to be clarified how participants in India use data. More so because large US and European multinationals have in the past displayed scant respect to laws other than those from US and European

authorities. Data privacy of consumers is an important agenda for policymakers today.

Pricing & Deep Discounting

Digital players with deep pockets design their rollout to burn huge cash to acquire customers. Unfair practices are prevalent where consumers are in no position to judge the actions of the participants. Consumers are lured by short-term gains to the detriment of other competitors in the ecosystem. E-commerce sites, food delivery, hotel booking, and airline booking offer huge discounts without any transparency. Other predatory tactics include dynamic pricing markdowns. Sometimes, intermediaries control these decisions without any say from the principal owners of the brands or services. Industry informants had raised these concerns to the competition commission in India regarding the activities of e-commerce players Flipkart and Amazon. The two e-commerce market places used to operate deep discounts through a network of private labels and preferred sellers.

Exclusive Tie-ups

The CCI in India investigated e-commerce platforms and food delivery apps in 2021 for restrictive practices where the incumbents used listing agreements to prevent price discovery and influence listing and consumer preference by using tags such as "Assured Seller" and "Fulfilled by".

Search and Ranking preference

A host of anti-competitive and collusive behaviour has emerged in Search. Google, the predominant market player in the search business, has exclusive commercial agreements with potential competitors to retain its monopoly. It has agreements with Facebook to place ads from Google on facebook. It has a revenue sharing agreement with Apple[8] and is being investigated in the United States.

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[8]   https://www.cnet.com/tech/mobile/apple-reportedly-has-ingredients-to-create-its-own-search-engine/

Consumer input their keywords on any platform and receive results based on algorithms. Organic search results should return products/services without any bias in top-selling or highest-rated results on the top. However, if any other products take precedence, it indicates search bias- in favour of sponsored products or orders fulfilled by the marketplace. This behaviour is very consistently evident in marketplaces. In the 2019 investigation of Flipkart and Amazon, the platforms stated that they have similar policies for treating exclusive tie-ups and preferred brands or sellers. The CCI observed that no competitive dynamics existed between the two large platforms due to these operative agreements.

Advertising Policies

Digital marketing is the key medium for marketing spends. It enables the exploitation of data through artificial intelligence and machine learning algorithms. Concerns exist about fair play, equitable access and privacy related to the entire basket of activities in advertising digitally.

A representative body of Indian traders, The Confederation of All India Traders (CAIT)[9], has demanded that the government intervene with a new e-commerce policy to curb anti-competitive practices by e-commerce majors. A Parliamentary panel in India formed to examine the issue suggested digital market entities "to desist from "anti-steering", "deep discounting", "self-preferencing", "search & ranking preferencing" and other practices that will impact completion." It called for classifying "systemically important digital intermediaries" based on their number of users, activities and revenues and a new digital competition law.

2. 2 Public versus Private Enterprises in Digital Markets

Market failures India experienced in the nascent e-commerce space are common and familiar. For example, the United States has experienced the same, and there is an exploration of how to handle firm attempts to monopolise or conspire to collaborate under the law.

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[9]   https://brandequity.economictimes.indiatimes.com/news/digital/anti-competitive-practices-in-digital-markets-cait-seeks-regulatory-body-for-e-commerce/96515290

Hovenkamp (2022) recommends that the United States should bring in an "abuse of dominance standards" to incorporate into the existing Sherman Act to take care of complex issues arising out of "self-preferencing" issues.

Eaves et al. (2019) argue that government can think wholistically and design wider digital innovations that are challenging for private companies to envisage. Hence, the government should facilitate access to businesses by acting as a platform. It should work around shared APIs, open standards and canonical datasets so that all actors – government employees, businesses and consumers can deliver better services with improved safety and accountability.

Platforms are a concept introduced previously in the public sector. Eaves et al. (2019) compare the highway system in the United States, Germany, and India to platforms.

> "A shared, national network of large, multi-lane roads links to a broader network of smaller local streets. The system works extremely well for the transportation of bulk goods across hundreds and thousands of miles; it also provides huge value for ordinary users, who only need to comply with a simple regulatory framework (e.g., lanes, engine types, vehicle width) to ensure accessibility across the entire network."

O'Reilly (2011) states that companies like Apple and Google provide essential services that governments should have provided. The role of a platform is explained as

> "a platform provider builds essential infrastructure, creates core applications that demonstrate the power of the platform and inspire outside developers to push the platform even further, and enforces 'rules of the road' that ensure that applications work well ".

2.3 Understanding ONDC

Open Network for Digital Commerce (ONDC) is an initiative to promote open networks for exchanging goods and services over digital or electronic

networks. ONDC is to be based on open-sourced methodology, using open specifications and open network protocols independent of any specific platform.

The foundations of ONDC are to be open protocols for all aspects of the entire chain of activities in exchange of goods and services, like hypertext transfer protocol for information exchange over the internet, simple mail transfer protocol for exchange of emails and unified payments interface for payments.

These open protocols would be used for establishing public digital infrastructure in open registries and open network gateways to enable information exchange between providers and consumers. Providers and consumers could use any compatible application of their choice for the exchange of information and transactions over ONDC.

Thus, ONDC goes beyond the current platform-centric digital commerce model where the buyer and seller must use the same platform or application to be digitally visible and do a business transaction.

2.4 The Beckn Protocol: Empowering Decentralised Networks for Local Commerce

The Beckn Protocol, at its core, facilitates open, peer-to-peer decentralised networks for cross-sector economic transactions. This innovative framework is designed to streamline local commerce, fostering the discovery of services and sales offers across various industries, all while remaining accessible through any consumer application. Key to its operation is the utilisation of cutting-edge 5G and high-speed network technologies, enabling the seamless integration of e-commerce capabilities into network and transport layers. This approach ensures that sales offers and services are readily available to the application layer of any Beckn-aware system, including middleware and firmware levels.

The Beckn Protocol is not just a concept but a well-structured set of open specifications that underpin its functionality. These specifications encompass protocol APIs, message formats, network design, and reference algorithms. They collectively empower multiple commercial service providers to merge their offerings into a unified, integrated customer experience. In essence, this decouples the digital infrastructure on the demand side, represented by

applications and various channels, from the service provisioning infrastructure on the supply side. As a result, integrated location-aware services are not confined to a single platform; instead, they can extend to any widely adopted online consumer interface, such as online maps, messaging apps, digital wallets, and voice assistant devices.

One of the core strengths of the Beckn Protocol is its decentralised architecture, eliminating the necessity of creating a centralised platform for the simultaneous integration of services from multiple providers. This approach not only promotes privacy but also ensures security by design, offering privacy-protected interactions within the network. The result is a highly versatile, secure, and efficient framework that empowers local commerce and decentralised networks while preserving user privacy and data security.

Examples of expanding ONDC services

Integrating Google Maps[10] with the metro train ticketing service will add a new dimension of service for DPI. The challenge with train ticketing in an environment with different operators is high. It has the potential to improve information availability to the travellers. Compare this with the ticketing cost for cine-goers with multiplexes. The cost of the service (for example, the application 'Bookmyshow') is high and does not reflect the nature of the service.

ONDC's Financial Services Expansion

ONDC is expanding its offerings to include financial services[11] such as personal loans, small and medium business loans, insurance (auto, health, marine), mutual funds and gift cards. This move integrates over 20 entities, including well-known brands like Tata Digital, Aditya Birla Capital, IndiaLends, DMI Finance and Karnataka Bank. However, the current design is to focus on specific financial services. This choice may be to differentiate ONDC from other platforms that offer other investment products such as stocks, bonds, mutual funds. ONDC has onboarded several fintech firms.

2.5 ONDC's Transformation Potential

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[10] https://techcrunch.com/2023/10/19/google-maps-to-let-users-in-india-book-metro-tickets-ondc/

[11] https://inc42.com/buzz/ondc-preps-walk-fintech-route-floats-specs-onboarding-financial-services/

Kedar Lele, executive director HUL, believes ONDC can revolutionise e-commerce like UPI did with payments. "ONDC is a platform-agnostic protocol that will link any buyer to all the available sellers on the web, boosting discoverability and building a more inclusive digital ecosystem. The core of ONDC is the principle of 'Bahujan Hitaya, Bahujan Sukhaya', which will democratise digitalisation and bring local Kirana stores into the mainstream by making them accessible to everyone. While unorganised trade is efficient, it often needs more effectiveness. ONDC can potentially revolutionise e-commerce and transform the digital commerce landscape."

2.6 How ONDC works

ONDC provides two different world views if you are a buyer versus a seller. And it connects these two worlds. A shopping platform, individual sellers or trading firms all have the same access and discoverability. All of them have access to the logistics providers and service providers. The sellers can reach all buyers equivalently. For buyers, they can independently access sellers and service providers and complete their purchase.

ONDC attempts to eliminate barriers to e-commerce adoption for small and medium enterprises. There could be multiple links in the economy that ONDC activates. Local retail ecosystems can access and fulfil online demand. It can improve unit economics by reducing acquisition costs, providing a free digital presence and lower inventory costs for all businesses. ONDC would be a completely formal economy, i.e. there is an auditable track record of business transacted. It can create trustworthy documentary data for small and medium enterprises to access formal sources of finance. Many service providers, irrespective of their digital proficiencies and location, shall get onboarded into the network. A high-standard digital ecosystem is open to all participants, overcoming barriers such as costs and knowledge. By improving the discoverability of small and medium enterprises, ONDC can improve their scale. The higher scale facilitates a cycle of investment, helping to grow the micro, small and medium enterprises in the economy.

3.0 The Impact of ONDC

As new users join the digital world in India, it is important to retain trust by providing a good user experience. Many of the new users in India are expected to be rural-based, and many of them will join the digital world in their state languages. It is important to resolve niggling issues and failure of the system and protect consumer trust. While users may aspire for low-cost offerings of all products and services, quality and convenience cannot be compromised.

Much investment is going into customer convenience, but there is also much fragmentation in the digital ecosystem.

The digital ecommerce model of new business is rooted in information being available about products and services to customers. Now, it is not a question of availability of information, but rather the access to information due to overload. Search solves this problem but creates a monopoly in the form of Google, with an 80 percent market share. A monopoly cannot be fair to each participant despite using fair principles. Competing participants are brands, sellers, resellers, and platforms that are trying to come higher in the search list by bidding for category keywords with Google. E-commerce platforms, representing many brands, emerge as wholesellers. The cost of acquisition of customers is lower than standalone business. At some level, ONDC wants to provide access to digital commerce to the smaller and weaker players.

An often talked about last mile connectivity in the ONDC context is the local Kirana store (Mom and Pop grocery store). Lets evaluate the challenges[12] here :

ONDC plans to enable other network partners to handhold the last-mile connectivity. For example, a recent advertisement of IDFC First Bank announced they will create an app registered with ONDC that will help their small business customers onboard ONDC. ONDC is one of many enterprises trying to list kiranas. In the past, Jio and Grofers attempted the same but failed. The large number of SKUs (3000-5000) and the need to regularly update the same is a huge challenge. ONDC plans to tackle this problem by having a

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[12] https://retail.economictimes.indiatimes.com/blog/understanding-ondc-from-first-principles/94387154

single standard catalogue. ONDC provides the standards, specifications, and protocols to create a universally accepted catalogue. The larger enterprise seller apps can be used to reduce the efforts required by small storefronts. However, maintaining updated prices or other sales promotions would be a considerable challenge to overcome. How would buyers discover the stores? The e-commerce platforms would naturally prioritise sellers listed with them on their platform. The platforms have already spent acquisition costs on search portals like Google. Regarding the customer experience, it is early to speculate whether a curated experience available with platforms can be replicated in ONDC, where there are moving parts, and the buyer or seller must make choices.

At another level, do small businesses need universal discoverability? Currently, they are discovered by consumers in their area who find contact details by trial and error and, communicate through phone or WhatsApp, and make payments through UPI. Can this experience be improved, and that too at a low cost?

The current state of e-commerce in India is characterised by low penetration and bias towards large metros. Post the covid 19 pandemic, adoption across tier 2 and tier 3 cities also improved. The current business models are platform-centric. A few such platforms dominate and control 70 percent of the e-commerce market. In such models, the design and execution decisions are vested with a single entity in the value chain. A monopoly of the platform provider implies higher margins.

Further, large sellers must maintain several storefronts on different platforms. Interoperability across platforms does not exist. Hence, businesses need to recreate stores for all platforms currently.

4.0 Challenges and concerns:

Data transfer, unethical practices, misselling, and consumer trust pose significant risks to the success and adoption of ONDC's financial services offerings.

ONDC's ability to effectively manage and provide quality offerings in new areas being offered is a key concern.

The fragmentation of the payments ecosystem in India is another challenge that ONDC must address to achieve its scale goals.

India is a large country with high diversity, including multi-lingual citizen. For ONDC to ensure equitable access it needs to create a localised application across regions. A robust security and privacy architecture will go a long way to maintain trust and encourage adoption. The said architecture is required to incorporate the requirements of the new data protection and privacy act passed by Indian parliament in 2023.

5.0 Conclusion

In conclusion, ONDC's vision of fostering an open, accessible, and secure digital commerce environment is poised to transform India's economic landscape. By addressing its challenges and leveraging its innovative protocols, ONDC has the potential to revolutionise the way businesses and consumers engage in digital commerce. As the platform continues to evolve, maintaining its commitment to security, privacy, and inclusivity will be essential for building trust and achieving widespread adoption. The journey ahead is one of great promise, where ONDC's impact on India's digital economy is yet to be fully realised.

Additional guidance and recommendations for policymakers and stakeholders who are interested in implementing digital public infrastructure include the following:

   i.   Develop a clear and comprehensive strategy for digital public infrastructure that outlines the desired outcomes, key stakeholders, and necessary resources.

   ii. Foster a culture of collaboration and partnership between the public and private sectors to ensure that digital public infrastructure is developed to meet all stakeholders' needs.

iii. Ensure that digital public infrastructure is built on open standards and specifications, as well as open-source software, to promote interoperability and avoid vendor lock-in.

iv. Prioritise security and privacy considerations throughout the design and implementation process to build trust among users and protect sensitive data.

v. Establish clear governance structures and accountability mechanisms to ensure that digital public infrastructure is maintained and updated regularly and that any issues are addressed promptly.

vi. Invest in capacity building and training programs to ensure that policymakers and stakeholders have the necessary skills and knowledge to implement and manage digital public infrastructure effectively.

By following these best practices, policymakers and stakeholders can ensure that digital public infrastructure is developed and implemented in a way that maximises its potential benefits and minimises the risks and challenges associated with such complex initiatives.

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About the Author:

Sudhanshu Pani is a PhD in Finance from NMIMS University. His work deals with analysing high frequency markets like NASDAQ in high resolution. He is an alumnus of IIM Indore and an honors graduate in Metallurgical and Materials Engineering from Utkal University. In a career spanning 22 years, Dr Pani has successful corporate stints with leading Banks like Standard Chartered Bank, HDFC Bank, ICICI Bank and HDFC Standard Life. He is also an entrepreneur having co-founded Finance Central, a boutique Wealth Management firm in 2005. Dr. Sudhanshu Pani is a faculty with the Finance area in School of Business Management. He teaches courses in accounting, corporate finance and financial modelling. In 2022, he launched India's first course on design of Consumer Finance Products. He is Chairperson of the MBA (Law) program since 2022. He has published 6 Research Articles in ABDC ranked International journals. He can be contacted at; sudhanshu.pani@sbm.nmims.edu.

THE DISRUPTIVE POTENTIAL OF STABLECOINS

Somnath Roy*

Operations and Data Sciences, School of Business Management
SVKM's Narsee Monjee Institute of Management Studies
(NMIMS), Mumbai, Deemed-to-be-University, India
E-mail: snr.kgp@gmail.com
(*Corresponding author)

Chandan Dasgupta

Finance, School of Business Management
SVKM's Narsee Monjee Institute of Management Studies
(NMIMS), Mumbai, Deemed-to-be-University, India.

Abstract:

The volatility of cryptocurrencies has been a dampener for users' fascination about cryptocurrencies. Stablecoins have been ideated to address this specific concern so that the best features of cryptocurrencies are available without the hiccups. Stablecoins seek to maintain a steady market value for their underlying cryptocurrency and therefore are more dependable and stable than other, better-known counterparts, like Bitcoin, which suffers from the issue of volatility where value fluctuations over a wide range tend to happen often. The stability of stablecoins is a result of their linkage with other assets, like dollars, euros, or gold, that are more stable in their market prices. Because of their 'stability', Stablecoins can be used in transactions without the fear of financial loss from unanticipated price fluctuations. Since stablecoins are essentially cryptocurrencies, they can be used in digital forms without any intermediaries and therefore can be less expensive and faster to operate than using traditional fiat currencies. This way stablecoins promises the best features of digital and physical

money, and hence it is considered to be one of the most promising breakthroughs in the cryptocurrency space. Stablecoin does, however, also have the potential to cause some difficulties for the financial system and the end users. Most countries do not yet have any significant regulations governing stablecoin. With respect to the duties and responsibilities from the issuers' side, there are no standards. Furthermore, there are no established guidelines for taxation, audit, or supervisory control and monitoring of stablecoins. Concerns regarding stablecoin's possible effects on monetary policy, consumer protection, and financial stability have been voiced by certain authorities. Effective legislation for global stablecoin arrangements has to rely on the collaboration and coordination of several authorities, much like as it is with cryptocurrencies. Users should be aware of the risks and uncertainties associated with utilizing this new form of money, even if there is no doubting the potential of this cutting-edge technology. This article seeks to unravel the mysteries of stablecoin, at an overall level, providing the readers with a birds eye view of the stablecoin landscape.

***Keywords:** Disruptive technology; Fintech; Digital Currencies; stablecoin; cryptocurrency; algorithmic money; stablecoin regulations; stablecoin overview*

Introduction

Stablecoins are cryptocurrencies whose value is backed up by another asset such as a fiat currency, commodity, or another cryptocurrency. A stablecoin, on the other hand, reduces the fluctuations and risks associated with the crypto market by reducing the volatility and unpredictability of cryptocurrencies like Bitcoin and Ethereum. By using digital tokens, users can transfer, store, and exchange value more easily (Anderson, 2023; Ante et al., 2021).

Blockchain technology's benefits, such as transparency, security, and immutability, have made stablecoins popular in the crypto space, despite their apparent drawbacks in other cryptocurrencies, such as volatility, uncertainty, and complexity. Moreover, the adoption of stablecoins has also been expanding, as they are used for various purposes, such as cross-border payments, remittances, e-commerce, lending, borrowing, and saving. Stablecoins grew in dominance despite the total crypto market cap shrinking. Market capitalization for cryptos peaked at $2.3 trillion in January 2022 and

dipped to $1.1 trillion in January 2023. Over the period, however, stablecoins have actually gained dominance. As of January 31, 2023, stablecoins accounted for 12.9% of the total crypto market capitalization, an increase of 5.6 percentage points from January 2022 (Ante et al., 2021; Mita et al., 2019).

Stablecoins can ensure faster, cheaper, and more inclusive access to financial services, thereby disrupting traditional financial systems. Besides this, stablecoins can challenge the dominance of fiat currencies and central banks through their decentralized existence. By virtue of their stability which is an integral part of their designs, stablecoins can enable more efficient and frictionless exchange of value, facilitate arbitrage and hedging opportunities, and enhance liquidity and price discovery in financial markets. Especially in developing countries, where traditional financial infrastructure is lacking or inadequate, stablecoins can also provide access to financial services to the unbanked and underbanked. Additionally, stablecoins may threaten the monetary sovereignty and stability of existing fiat systems by competing or replacing the official currencies and monetary policies of the countries (Adachi et al., 2021; Ashmore, 2022; Hayes, 2023; Ozili, 2022).

However, stablecoins are not without challenges and trade-offs, as they have to balance between achieving price stability, scalability, governance, and regulation. There are different types and mechanisms of the functioning of stablecoins, such as those backed by fiat currencies, those by commodities, those that are pegged to other cryptocurrencies, and those that operate through algorithmic logic, each with its own advantages and disadvantages. Moreover, stablecoins also face regulatory scrutiny, scalability issues, auditability concerns, and trust issues, which may limit their growth and adoption (Catania & Grassi, 2022; G7WG, 2019).

This article introduces the concept of stablecoins, exploring its background and context, their advantages and disadvantages, and the importance of regulatory frameworks for stablecoins, while taking a peek at the future of stablecoins in the crypto space.

1. BACKGROUND AND CONTEXT

As an alternative to traditional fiat currencies, stablecoins evolved from early attempts to create digital currencies such as e-gold and Liberty Reserve. They were, however, eventually shut down due to multiple challenges - regulatory and otherwise. BitUSD and NuBits were among the first stablecoins introduced in 2014. In order to deal with the volatility of cryptocurrencies, they were tied to a stable asset, such as the US dollar (Chalopin & Scott, 2022; Gondek, 2023; Hayes, 2023; Rice, 2019).

With stablecoins evolving over time, there are now a variety of stablecoins that operate using different mechanisms. In fiat-collateralized stablecoins, a fiat currency, such as the US dollar, is held as collateral. Stablecoins that use commodity collateral peg their value to other assets, like gold or silver. Crypto-collateralized stablecoins are backed by other cryptocurrencies. For algorithmic stablecoins, smart contracts and program logic are used to maintain price stability (Hayes, 2023).

Over the past few years, stablecoins have gained substantial traction in the crypto market. Among the most popular and widely used stablecoins are Tether, USD Coin, Dai, and Empty Set Dollar. With a market capitalization of over $70 billion as of November 2023, Tether is the largest stablecoin by market capitalization. Aside from facilitating cross-border payments, stablecoins provide liquidity for decentralized exchanges, and they can also be used for lending and borrowing (Hayes, 2023; Hileman, 2019; Lee, 2023).

Compared to other cryptocurrencies stablecoins differ in several ways. In contrast to cryptocurrencies like Bitcoin and Ethereum, which are highly volatile, stablecoins maintain a constant price relative to another asset. Also, stablecoins are able to handle a higher volume of transactions per second than Bitcoin and Ethereum, which makes them more scalable. Due to the fact that stablecoins are often backed by centralized entities, such as banks and financial institutions, they are governed and regulated differently than other cryptocurrencies (Ashmore, 2022; Hayes, 2023; Martino, 2023; McCracken, 2022).

Stablecoins tend to maintain a stable value by balancing the various operational aspects of liquidity, security, trust, and compliance. The fiat-collateralized stablecoin, holds reserves of fiat currencies like the US dollar to balance its value. However, this approach may be subject to higher regulatory scrutiny and requires trust in the custodian of the relevant fiat currency. Since the price of the underlying commodity is subject to fluctuations, commodity-collateralized stablecoins may also face similar challenges. As crypto-collateralized stablecoins are pegged to other cryptocurrencies that are not necessarily stablecoins, there are liquidity risks associated with them. Stablecoins based on algorithms may be subject to cyber security manipulation risks or may not respond appropriately to market conditions. (Hayes, 2023; Mita et al., 2019; Moin et al., 2020).

2. STABLECOINS – ADVANTAGES

The benefits of cryptocurrency are all present in stablecoins, sans the volatility. As a result, they score higher on the usefulness index as a medium of exchange than regular cryptocurrencies. Additionally, they offer a safe haven asset for individuals who wish to store value without the risk of losing their fiat currency. Aside from offering 24/7 transactions, stablecoins are also faster than traditional cryptocurrencies. Due to the limited operating hours and lengthy processing times of traditional banking systems, this represents a significant advantage. Stablecoins can overcome this settlement limitation. Stablecoins can be used to make payments. By accepting stablecoins as payment, businesses can avoid intermediary fees associated with transaction processing. Among the primary uses of stablecoins in the future will be payments, with companies like Walmart bringing their own to the market. The correspondent banking system can also be bypassed with stablecoins. In this way, cross-border payments and remittances can be made without the need for an intermediary. The feature is especially helpful to migrant workers whose money is often sent home at high costs. Nippon Yusen Kaisha, a Japanese shipping company, pays workers using USD-pegged stablecoins. As a result, sea workers can manage their finances easier and send and convert money back into their local currencies more smoothly. Payments are also transparent and trackable with stablecoins. The ability to track and verify

transactions is especially useful in a business context. In addition to being permissionless and peer-to-peer, stablecoins are capable of self-custody. A user has full control over their assets and can transact directly with others without the involvement of a third party. Trading can also be done with stablecoins. Traders and exchanges looking to shrink their crypto exposure can utilise these solutions (Altercap, 2023; AnycoinDirect, 2023; Ashmore, 2022; BitPay, 2023; Catalini & Massari, 2021; Crypto.com, 2022; FinanceMagnates, 2023b; Fitzner, 2022; Hoang, 2019; Kołodziejczyk & Jarno, 2020; McCracken, 2022; Mita et al., 2020; Petrov, 2022; Sudaric, 2021).

Looking ahead, stablecoins are expected to play an influential role along with cryptocurrencies in the financial ecosystem.

3.   STABLECOINS - RISKS AND ISSUES

In recent years, stablecoins have become increasingly popular. Even though stablecoins are intrinsically designed to hold their valuation at a stable level, they are not immune to fluctuations in price, market capitalization, and liquidity. It is possible for stablecoins to de-peg below or above their pegged value due to a variety of factors. The frequency and duration of de-pegging also differ. A good governance system, collateral, reserves, and market confidence are required to maintain a peg and the stabilization mechanism (Li & Shen, 2021; Polizu et al., 2023).

Stablecoins may deepen the digital divide by creating a gap between those who have access to and can benefit from stablecoins, and those who do not, due to the lack of digital literacy, infrastructure, and awareness. For instance, stablecoins require access to digital wallets and exchanges, which may not be available to everyone, especially in developing countries. Moreover, stablecoins may require a certain level of technical expertise and knowledge to use, which may exclude some users from their benefits (DCGC WEF, 2021).

A stablecoin's viability, functionality, and stability may be compromised by market volatility risks. Stablecoins might lose their peg to underlying assets in the event of price fluctuations, liquidity shocks, and black swan events, for

example. The adoption and acceptance of stablecoins may also be affected by regulatory scrutiny and legal challenges. Stablecoins that fail to perform as expected could harm their users and pose a systemic risk. Stablecoins that do not perform as expected may experience a "run" - i.e., a perpetual cycle of redemptions and fire sales. Runs on stablecoins could result in sharp outflows of bank deposits or disruptions of other sources of funding for banks, depending on the type and volume of assets involved. A stablecoin run could spark a contagion - to other stablecoins or other financial institutions with similar risk profiles. A lack of prudential standards could also increase risks to the broader financial systems (McCracken, 2022; PWGFM et al., 2021; van Echelpoel et al., 2020).

A stablecoin arrangement's transfer mechanism between issuance and redemption can increase payment processing efficiency, but they can also pose risks for the financial system and its participants. In addition to credit and liquidity risks, operational risks, and risks associated with system governance, compared to traditional payment systems, payment stablecoins face similar risks (PWGFM et al., 2021; van Echelpoel et al., 2020).

While stablecoins are small compared to traditional forms of money (both private and public), they may grow rapidly at a specific and overall level. The potential for stablecoins to scale rapidly raises a number of concerns. The financial stability and real economy could suffer if a key participant in a stablecoin arrangement fails or suffers distress. The stablecoin issuer may acquire too much control over the economy in the event of exponential scaling. This could result in adverse effects on competition and market concentration in sectors of the real economy. There might be anti-competitive concerns with wide adoption of stablecoins become as a means of payment. Users' switch to other payment services or products may encounter unwarranted friction, for example. In the absence of interoperability standards for stablecoins and stablecoin arrangements, concerns about anti-competitive effects may be greater (Ferreira, 2021; PWGFM et al., 2021).

Stablecoins' growth could also have significant effects on the macroeconomic system. It is possible for stablecoins to increase borrowing costs and impair credit availability if insured depository institutions lose retail deposits to stablecoins and stablecoin reserves are incapable of creating credit. A significant and sudden inflow or outflow of deposits may also occur during times of stress, changing perceptions of the safety of insured depository institutions. (Bojaj et al., 2022; PWGFM et al., 2021).

In comparison to other types of stablecoins, algorithmic stablecoins have several disadvantages. Because algorithmic stablecoins rely on complex algorithms and smart contracts, they are more complex, uncertain, and unpredictable than other stablecoins. Consequently, their stability and security may be compromised by bugs, hacks, and exploits. As algorithms are relatively new and untested, algorithmic stablecoins are less likely to be adopted, accepted, or integrated than other stablecoins (Briola et al., 2023; Genç, 2022; Kazemian et al., 2022).

4. STABLECOINS – REGULATION

To address risks associated with stablecoin activity, regulators and international organizations have been consulting the different stakeholders in the ecosystem to develop regulatory proposals. One goal is to identify how stablecoin arrangement characteristics are similar to the traditional financial system, in order to develop regulation that can be classified as 'technology neutral' (i.e. activities being similar, risk profiles will be the same, that will be requiring similar regulations). Financial stability risks related to crypto are being studied by central banks, domestic authorities, and international bodies. Global stablecoins - stablecoins whose reach and use could be extended across multiple jurisdictions and which could become systemically important in and across one or more jurisdictions - are developing a consistent and comprehensive regulatory approach under the leadership of international bodies (Arner et al., 2020; G7WG, 2019; Schwarcz, 2022).

A stablecoin's regulatory framework differs from other cryptocurrencies in several ways. Stablecoins have unique characteristics that require specific

regulatory attention. A stablecoin can be classified as a digital asset or as a security, depending on its type, mechanism, and jurisdiction. Bank regulations may apply to fiat-collateralized stablecoins, while securities regulations may apply to algorithmic stablecoins. Additionally, stablecoins may be subject to additional regulations (AML and KYC, for instance), to prevent illicit activities such as money laundering and terrorist financing. In addition to protecting users, issuers, and regulators' rights, stablecoin regulatory frameworks aim to ensure stability, soundness, and legitimacy, and are therefore more complex than those for other cryptocurrencies. (Ashmore, 2022; Dowsett, 2023; Martino, 2023; McCracken, 2022; Vasyukov et al., 2023).

It is the purpose of stablecoins to maintain a stable value relative to a fiat currency, commodity, or other cryptocurrency. Their aim of achieving stability in value distinguishes them from other cryptocurrencies that are volatile and speculative. Moreover, stablecoins have a variety of use cases that includes payments, remittances, and financial services, making them subject to varying legal classifications and definitions, depending on their use case. Depending on the regulatory body and jurisdiction, stablecoin regulation is also subject to different standards and guidelines. Financial Stability Board (FSB) recommendations, for example, aim to enhance the safety, soundness, and legitimacy of stablecoins, as well as promote financial stability and investor protection by regulating, supervising, and overseeing global stablecoin arrangements. A report published by the International Organization of Securities Commissions (IOSCO) provides guidance on how securities laws and regulations apply to stablecoins based on their structure and characteristics. (Arauz, 2021; Congressional Research Service, 2022a, 2022b; DCGC WEF, 2021; Financial Stability Board, 2023; FSOC, 2022; IOSCO, 2021; PWGFM et al., 2021; Zhu, 2023).

Regulatory frameworks for stablecoins differ from those for other cryptocurrencies because they aim to ensure the safety, soundness, and legitimacy of stablecoins, as well as protect the rights and interests of users, issuers, and regulators. Since stablecoins have unique characteristics, the regulatory framework for them is more complex than for other

cryptocurrencies. In terms of their type, mechanism, and jurisdiction, stablecoin regulatory frameworks are subject to different legal classifications, definitions, and standards.

5. FUTURE OF STABLECOINS

In the future, it is possible for stablecoins, including algorithmic ones, to play an important role in payments and financial services. Integration with other emerging technologies, such as decentralized applications, smart contracts, and the Internet of Things, can expand their use cases, user base, and network effects. Cross-border payments can be made faster and cheaper with stablecoins, micropayments and remittances made easier, and financial services made available to underbanked and unbanked populations. Further, stablecoins have the potential to challenge the dominance of fiat currencies and central banks, and promote financial inclusion and innovation (Catalini & Gans, 2016; McCracken, 2022; Thomason, 2021; Zemp, 2023).

The use of stablecoins for payments and savings can positively impact financial inclusion, as people are able to build digital histories, which are crucial for getting credit. For small and micro businesses, stablecoins can increase cross-border trading opportunities. Moreover, asset-backed stablecoins offer a more stable and secure alternative in the crypto space, attracting more conservative investors. Many developing countries rely on remittances to earn an income, which can be reduced through the use of stablecoins, which eliminate intermediaries and reduce transaction fees. Additionally, stablecoins can offer a more stable and secure way to store value, thereby protecting against inflation and currency devaluation. Stablecoins confront a number of difficulties, including market volatility, regulatory ambiguity, and liquidity problems. Adoption of stablecoins and sustainable development are facilitated by the establishment of strong regulatory frameworks. These frameworks are anticipated to guarantee the safety, soundness, and validity of stablecoins in addition to safeguarding the rights and interests of users, issuers, and regulators. Stablecoin regulatory frameworks can ease cross-border transactions, prevent regulatory fragmentation, and lessen the dangers and difficulties related to stablecoins

(Arauz, 2021; Ardic et al., 2022; Financial Stability Board, 2023; Thomason, 2021).

Stablecoins have a lot of obstacles to overcome before they are widely accepted. The emergence of digital currencies issued by private companies and central banks (sometimes referred to as CBDCs and PDCs) presents the biggest hurdle. A PDC and a CBDC differ primarily in that a PDC is issued by a private corporation, such as Diem on Facebook. One form of digital money that central banks create is called CBDC, which is a representation of their fiat currency. CBDCs and PDCs are more feasible alternatives to stablecoins since they not only have the same advantages as stablecoins but also because they are probably supported by a stronger legal environment. Globally, there is growing interest in CBDCs; several nations, such as China, India, Sweden, and the Bahamas, have already started testing or introducing CBDCs, and additional initiatives are in the works. It should be mentioned that, in spite of a number of legal and technological obstacles, PDCs - like Facebook's Diem - have attracted a lot of interest from investors and authorities in recent years. Stablecoins are hindered from gaining broader market acceptance due to concerns about inconsistent and unclear regulations. It is possible that different legislation may apply to a stablecoin depending on its mechanism, type, and jurisdiction. This could lead to misunderstandings and impede the stablecoin's adoption because of the disparate regulations. Furthermore, the usefulness and feasibility of stablecoin platforms may be negatively impacted by technological and operational constraints linked to interoperability, scalability, and security issues (Allen et al., 2022; Browne, 2021; Daily Post Nigeria, 2023; FinanceMagnates, 2023a, 2023b; Mims, 2023; Ozili, 2022; Sandner et al., 2020; Zelmer & Kronick, 2021).

Stablecoin adoption may be hampered by user confusion brought on by the inconsistent and unclear regulatory framework. The many mechanisms and jurisdictions that govern stablecoins can make them less interoperable and consequently make it more difficult to utilize them for cross-border transactions. Additionally, there can be operational and technical constraints, such as security threats, interoperability challenges, and scalability issues, that

affect the usefulness and feasibility of stablecoin platforms. Stablecoin platforms need to overcome these obstacles in order to maintain their safety, soundness, and legitimacy as they expand and become more widely used (FinanceMagnates, 2023a; Liao & Caramichael, 2022; Thomason, 2021).

6. CONCLUSION

Stablecoins are backed by fiat money, commodities, or other cryptocurrencies to preserve their value in respect to their pegged assets. Consumers now have an alternative to the value-instability of Bitcoins and other cryptocurrencies in the form of stablecoins, which have gained in popularity recently. Stablecoins have the potential to upend established financial systems by offering more accessible, inexpensive, and inclusive financial services, in addition to upending the dominance of fiat currencies and central banks. Adoption of stablecoins is hampered by a number of factors, including legislative regimes that are unclear and inconsistent, stablecoin platforms' operational and technical constraints, and competition from other digital currencies like PDCs and CBDCs (Arslanian, 2022; DCGC WEF, 2021; McCracken, 2022).

Although stablecoins have the potential to improve payment and other financial services, there is a chance that they will cause hazards for users, investors, and the larger financial system. Stablecoin architecture and its integration with the established banking system greatly influence this risk. Even though stablecoins have a low base, they are gaining popularity as new use cases emerge, such as their potential use as a payment method or settlement method, and may continue to grow rapidly in the future. Regulatory agencies are examining stablecoins as a means of preserving financial stability and supporting innovation. This is to ensure that all categories of stakeholders including investors and users are provided with appropriate safeguards (Bains et al., 2022; Dark et al., 2022).

Understanding the disruptive potential of stablecoins is essential if we are to shape the future of finance in the right direction. Stablecoins, as well as having an impact on the monetary and financial systems, have implications for society at large as well. As a result of stablecoins, international payments can

be made faster and cheaper, micropayments can be made easier and remittances can be made more convenient, and unbanked and underbanked populations can be brought into the scope of financial services. Besides the fact that stablecoins promote financial inclusion and innovation, they also pose a challenge to the dominance of fiat currencies and central banks in the financial system. It is also necessary to address the risks and challenges that stablecoins face, such as market instability, liquidity risks, and regulatory uncertainty, so as to ensure their safety, soundness, and legitimacy in the long run (Adachi et al., 2021, 2022; European Central Bank, 2022; Liao & Caramichael, 2022; Rice, 2019; Singh, 2023).

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About the Authors:

Somnath Roy is an ex-IT Professional currently pursuing his Academic interests as a faculty in Information Systems and related subjects at the School of Business Management (SBM), Narsee Monjee Institute of Management Studies (NMIMS) University. His research interests include the latest developments on the technology front (like Blockchain & Cryptocurrencies, Fintech and Artificial Intelligence) and their societal impacts. He can be contacted at snr.kgp@gmail.com.

Chandan Dasgupta is a Professor of Finance and Banking at the School of Business Management (SBM) of Narsee Monjee Institute of Management Studies (NMIMS) University. He has a PhD in management, an MA, an MBA in finance, and several professional qualifications. He has 30 years of teaching experience and 22 years of industry experience in the banking sector. He teaches courses on strategic financial management, commercial bank management, corporate finance, financial accounting and analysis, and fintech. He has published many papers in international journals and conferences on topics related to finance and banking. He is also a research guide for PhD scholars and has contributed to a couple of finance-related books. He is the former associate dean of the MBA program at NMIMS. He is one of the distinguished faculty members of SBM NMIMS Mumbai.

UTILIZING SOCIAL MEDIA BY GOVERNMENTS TO AUGMENT CITIZEN ENGAGEMENT

Kirti Wankhede

Data Science and Technology Department
K. J. Somaiya Institute of Management, Somaiya Vidyavihar University, Mumbai, India.

Preeti Khanna*

Operations and Data Sciences, School of Business Management
SVKM's Narsee Monjee Institute of Management Studies
(NMIMS) Deemed-to-be-University, Mumbai, India
E-mail: preeti.khanna@sbm.nmims.edu (*Corresponding author)

Abstract:

Examining the role of social media, the paper delineates its multifaceted influence on government-citizen relationships, e-governance, and democratic processes. Highlighting the use of platforms like Twitter, Facebook, and specialized apps, it evaluates their effectiveness in enhancing transparency, accountability, and citizen participation in public policies. Case studies on notable government officials' and agencies' social media strategies in India, such as Prime Minister Narendra Modi's NaMo App, and the Election Commission's collaboration with Facebook, exemplify diverse approaches to leveraging social media for citizen-government interaction. The findings reveal the significance of social media in enhancing government-citizen communication, crisis management, and citizen service delivery. Furthermore, the study underscores the opportunities, challenges, and the potential of social media in reshaping political discourse and civic engagement among Indian citizens, especially the youth. Ultimately, this chapter contributes valuable insights into the expanding role of social media in Indian governance, offering an in-depth analysis of its impact on public service, political outreach, and citizen participation.

1. Introduction

The emergence of social media has revolutionized global connectivity and information dissemination, influencing spheres ranging from personal interactions to governmental operations. This study explores the impact of social media on governance, civic engagement, and political outreach, with a specific focus on Indian government initiatives. It scrutinizes the adoption of various platforms by Indian politicians and governmental bodies to interact, communicate, and engage with citizens.

The rise of social media has fundamentally reshaped the way people connect and share information. It has not only revolutionized information dissemination but has also eliminated traditional gatekeeping barriers. Social media platforms allow for immediate feedback and interaction, facilitating a more democratic flow of information. With approximately 2.46 billion social media users worldwide in 2017, there is clear evidence of social media's growing influence on E-governance and E-democracy (Nseke, P. 2018). Prominent world leaders like Donald Trump and Barack Obama harnessed the power of social media during their historic electoral victories, while other authoritarian leaders witnessed the downfall of their regimes, as exemplified by the Arab Spring in North Africa (Tufekci & Wilson, 2012).

2. Social media, government and civic engagement

Social media primarily serves as a platform for maintaining connections with friends and family (Komito, 2011). However, it extends its utility to various other domains, including business (Beier & Wagner, 2016), entertainment (Shen et al., 2016), scientific research (Chen & Zhang, 2016), crisis management (Stieglitz et al., 2017a), politics (Stieglitz & Dang-Xuan, 2013), campaigns and citizen services, customer interactions (Griffiths & McLean, 2015), and product placement (Liu et al., 2015). Governments have increasingly embraced web 2.0 social media as a novel channel for engaging with citizens across various phases of public policy development. The literature discusses the emergence of Government 2.0 and the global adoption of social media in governmental

processes. Social media presents a unique opportunity to foster stronger interactions between governments and citizens by enhancing many-to-many communication channels (Sivarajah et al., 2015). There is a general consensus that governments should actively utilize social media in their operations.

The utilization of social media presents a spectrum of opportunities for governments, encompassing various facets such as communication campaigns and citizen services (Bertot et al., 2012), monitoring for quality enhancements (Crowe, 2010), fostering community building and promoting civic improvements among citizens (Bell, 2013), and broadening access to government services (Heaton, 2011). Additionally, it aids in addressing public safety concerns (Guire, 2011), enhancing operational transparency and accountability, thus nurturing trust in governmental activities (Mergel, 2012; Picazo-Vela, et al., 2012). Social media also plays a pivotal role in boosting citizen engagement in public policy-making (Kavanaugh et al., 2012), improving public service delivery (Mergel, 2012), sourcing innovative solutions through crowd participation (Bertot et al., 2012a & 2012b), and expediting information dissemination during crises and natural disasters, benefiting both citizens and government (Chavez et al., 2010).

Citizens and civic groups harness a multitude of platforms, such as Twitter, Facebook, and Reddit, to discuss political matters and engage with civil society groups and political figures. Similarly, candidates and political parties leverage social media to manage their public image and communication with journalists and the public. Although multiple factors influence the adoption of social media by political actors, the vast majority actively endeavor to integrate these platforms into their campaigns. Specifically, Twitter has offered political organizations a global platform to broadcast information, participate in ongoing debates, engage in interactive discussions with the public, and contribute to political processes and campaigns.

3. Benefits that social media could bring in to support government communications

Like any communication platform, social media presents both advantages and potential risks. Before governmental bodies and political parties begin utilizing these tools, it is crucial to thoroughly evaluate and assess these benefits and risks.

a) Increasing Audience Reach and Accessibility and Communication: Social media platforms have the potential to extend the reach of government communication to a broader and more diverse audience. This enhances the accessibility of government information, making it available to a wider segment of the population. Government agencies that adapt their communication methods to align with the preferences of their constituents are better positioned to engage effectively with the public (Wright et al., 2019).

b) Meeting Public Expectations and promoting Transparency: In the digital age, the public expects government organizations to function as modern service providers. Effective use of social media not only meets these expectations but also enhances the government's reputation as a responsive and accountable entity. Social media channels offer governments a platform to share information openly, fostering transparency and accountability.

c) Supporting Stakeholder Relationships and continuous feedback: Governments can employ social media to cultivate more involved and interactive relationships with citizens, partners, and other stakeholders, facilitating two-way communication (Karna et al., 2018). Social media facilitates real-time feedback and input from the public, enabling governments to adapt their policies and services based on citizen input (Mossberger et al., 2018).

d) Crisis Communication and Timely Information Dissemination: Social media's rapid and widespread nature has proven invaluable during crisis situations. Recent examples, such as the response to the COVID-19 pandemic, illustrate how social media enables quick and reliable

dissemination of timely information and coordination of emergency responses.

e) Cost-Effective Communication: Compared to traditional media, social media platforms provide cost-effective means of communication, allowing governments to allocate resources more efficiently. Recent Indian government initiatives emphasize the cost-effectiveness of social media in disseminating information to citizens.

f) Responsive Civil Society: By facilitating communication and engagement, social media contributes to the creation of a highly responsive civil society, encouraging informed and active participation in public affairs. Recent surveys (Pandey et al., 2021) indicate that social media platforms are increasingly becoming channels for civic engagement in India.

4. Social media concerns

There are many multifaceted challenges faced by government authorities and officials as they navigate the adoption and use of social media in their interactions with citizens.

a) Misinformation and Disinformation: Social media is a breeding ground for the rapid spread of misinformation and disinformation. Citizens and entities can easily disseminate false or misleading information, leading to public confusion and panic. The studies by Jalonen & Jussila (2016) and Wall et al. (2017) highlight the prevalence of misinformation in the social media landscape. Government agencies must grapple with the challenge of discerning between accurate and false information and countering the latter effectively.

b) Security Risks: Governments are entrusted with sensitive information and the safeguarding of national interests. However, social media platforms pose security risks, including data breaches, cyberattacks, and unauthorized access. Mergel & Greeves (2013) emphasize the importance of addressing these security concerns. Government officials

must carefully manage these risks to protect classified and sensitive data.

c) Opportunity Costs: The adoption and use of social media come with associated opportunity costs. Zimmer (2012) underscores the significance of resource allocation. Government agencies must invest time, finances, and human resources into managing their social media presence. Balancing these investments against the benefits of citizen engagement is a continuous challenge.

d) Circulating Rumors and Fake News: The circulation of rumors and fake news on social media platforms can undermine trust in government information sources. Qin et al. (2015) highlight the threat that false information poses to public trust. Government authorities must develop strategies to combat the spread of rumors and fake news while ensuring the accuracy of their communications.

e) Credibility of Users: The credibility of users on social media varies widely. Yu & Zou (2015) explore the issue of user credibility. In the context of government adoption, ensuring the credibility of users who represent government agencies is vital. Users should be perceived as reliable sources of information, enhancing public trust in government communication.

5. Real cases: social media and Indian politics (Indian use cases)

In the domain of government social media engagement, the Center for Disease Control's "Social Media at CDC" site stands as a commendable example, offering a wide array of tools for public interaction and communication on various health-related topics. In the realm of Indian politics, notable figures such as Minister of External Affairs Sushma Swaraj and Prime Minister Narendra Modi have adeptly harnessed social media to connect with Indian citizens, with a particular focus on engaging the youth. Certain Union Ministers have also employed social media to provide direct assistance to citizens in need. While a study revealed limited social media usage among Indian youth, it underscored their perception of social media as a valuable platform for political discussions, even though relatively few consider it an

effective tool for political engagement (Rupa & Karnamaharajan, 2015; Internet and Mobile Association of India, IRIS Knowledge 2014; Mahajan, 2017). Recent updates in this landscape continue to show the potential for social media to play a pivotal role in shaping political and civic engagement among India's increasingly digital-savvy youth.

#TwitterSamvad

Prime Minister Narendra Modi (@narendramodi) inaugurated #TwitterSamvad, a service designed to facilitate direct communication between the government and Indian citizens. This service involves 16 government accounts, including the Prime Minister's account, as well as those of various chief ministers, Indian Railways, the Indian Army, and others, enabling them to send tweets as SMS messages to the Indian populace. The primary objective is to enhance the nation's e-governance initiatives by allowing government entities and leaders to engage with citizens through daily tweets and SMS messages on their mobile devices, fostering more direct and accessible communication. The #TwitterSamvad initiative continues to play a pivotal role in India's e-governance landscape. Prime Minister Narendra Modi and various government authorities, including Chief Ministers and government agencies, actively utilize this platform to disseminate important information, policy updates, and engage with citizens directly via SMS-delivered tweets. This ongoing service remains essential in ensuring that government communications reach a diverse and widespread audience, including those with limited smartphone and internet access, contributing to the government's commitment to digital inclusivity and transparent governance.

Indian Railways' Twitter Account @RailMinIndia

The Railway Ministry's Twitter handle, @RailMinIndia, boasting 3.5 million followers, serves as an invaluable link between Indian Railways and commuters, efficiently addressing around 3,000 daily complaints out of 6,500 mentions. This social media platform, manned by a dedicated team of 150 staff members across 68 divisions, not only monitors passenger messages around the clock but also ensures prompt resolution of issues while proactively

informing passengers about the actions taken in response to their grievances. This exemplary use of social media exemplifies the Indian Railways' commitment to improving customer service and offers a compelling case for academic and policy research on government-citizen communication and grievance redressal through digital platforms.

Honourable President of India (Past), Mr. Ram Nath Kovind's Facebook Live videos

Six months into President Ram Nath Kovind's tenure, his social media presence has experienced significant growth, with Twitter followers increasing by nearly 600,000 and his ranking as the second most popular Indian on Facebook. This surge is attributed to the newly established social media team in the President's office, which executed successful projects such as a 43-second viral video showcasing accessible areas of the Rashtrapati Bhavan, resulting in 1 lakh views, 21,000 likes, and over 6,000 retweets. The video, inviting the public to explore the Rashtrapati Bhavan, has contributed to a heightened interest in visiting the President's residence, leading to an increase in weekly visit days from three to four. This success underscores the power of social media in enhancing public engagement and communication with government institutions.

NaMo App by Honorable Prime Minister of India, Mr. Narendra Modi

The NaMo app serves as a comprehensive platform for real-time updates on the Prime Minister's daily activities, offering direct communication through messages and emails. Users can earn badges via tasks, access 'Mann ki Baat' episodes, read the Prime Minister's blogs, and explore his biography. The app provides insights into 'Good Governance,' government initiatives, and global recognition efforts, supported by compelling infographics. Videoconferencing interactions personalize the campaign, showcasing the tangible impact of governance on people's lives. Recent updates include enhanced visibility through advertisements on Doordarshan and All India Radio, alongside the Prime Minister's endorsement during 'Mann ki Baat,' reaffirming its significance for direct engagement with citizens and highlighting the government's achievements

Mumbai Police on Twitter

Since its Twitter debut in December 2015, the Mumbai Police's Twitter accounts, @CPMumbaiPolice and @MumbaiPolice, have become prominent platforms. Known for their wit and humor, they tackle misinformation and serve as sources of critical information. Managed by a mix of police officers and social media consultants, they use humor and puns to deliver awareness messages on various issues. Their responsiveness on Twitter emphasizes transparency and accountability, defying the conventional police department stereotype. These accounts engage a new generation effectively, sharing essential messages on topics like cyberstalking, piracy, traffic safety, and drug awareness. Recent updates reflect their continuous engagement with the public, reinforcing their role as an accessible and informative resource for citizens.

Election Commission of India ties up with Facebook India

In a pioneering partnership with Facebook, the Election Commission of India leveraged the platform's vast user base of over 217 million to encourage newly eligible 18-year-olds to register to vote. Through personalized News Feed reminders with birthday wishes, exclusively targeting first-time voters, the campaign reached a wide audience. Delivered in 13 Indian languages, it provided users with a 'Register Now' button, directing them to the National Voters' Services Portal for simplified registration. This innovative initiative underscores the role of social media in engaging and empowering first-time voters in India. Recent updates indicate a continued commitment to harnessing digital platforms for democratic participation.

6. Conclusion and discussion

The study reveals that social media plays a substantial role in the activities of the Indian government, with its purposes spanning from communication to engagement. It is evident that the Indian government actively utilizes social media as a direct means of reaching out to its citizens. The visibility provided by social media appears to transform the role of observers, whether they are witnessing instances of injustice, crises, shortcomings in services, or participating in various forms of protest (Cowart et al., 2016).

The evolving landscape of social media has reshaped the dynamics of public engagement, offering governments a direct avenue to interact with citizens. This transformation, evident through the worldwide adoption of social platforms, has catalyzed a significant shift in governance, from top-down information dissemination to a more interactive, transparent, and participatory model. Governments globally have recognized the potential of social media in fostering e-governance and democracy, leveraging its capabilities to bridge the communication gap with citizens (Nseke, P. 2018). The multifaceted use of social media, spanning diverse domains such as crisis management, civic engagement, and public service delivery, underscores its relevance and the broad spectrum of benefits it can offer. However, alongside these advantages, concerns persist regarding misinformation, security, and credibility, necessitating vigilance and strategic management to mitigate risks.

Real-world cases in Indian politics vividly illustrate the profound impact of social media. Initiatives like #TwitterSamvad, Mumbai Police's Twitter engagement, and the Election Commission's collaboration with Facebook highlight the transformative power of social platforms in improving governance, fostering citizen participation, and enhancing government-citizen interactions.

In conclusion, while social media undeniably offers a promising avenue for governmental communication and citizen engagement, its effective implementation necessitates a strategic and vigilant approach. Harnessing the full potential of social platforms demands a balance between leveraging its benefits for enhanced governance while navigating the challenges it presents. Moving forward, governments must continuously adapt, employing these platforms effectively to strengthen transparency, accountability, and citizen participation in governance—a pivotal step towards a more inclusive and responsive governance paradigm.

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About the Authors:

Kirti Wankhede is a distinguished professional in the field of IT Management, holding a Ph.D. in the subject. With over fifteen years of invaluable experience in teaching Computer Science and IT-related subjects, she has been a beacon of knowledge for postgraduate students. Her expertise spans across various domains, including Big Data Analytics, Data Science, and Web Technologies. She is not only an accomplished educator but also a sought-after speaker and consultant. She has conducted Management Development Programs and delivered guest lectures on Big Data Analytics and Advanced Excel tools to numerous reputable companies, including GBL, INS Hamla, BARC, and the Insurance Institute of India, as well as various academic institutions.

Preeti Khanna is an Associate Professor in the area of Operations and Data Sciences in the School of Business Management, SVKM's Narsee Monjee Institute of Management Studies (NMIMS), Mumbai. She has an overall experience of more than two decades in the field of Information Systems, and Technology Management in various capacities as an academician and researcher in business school. Her research interests lie in the domains of digital product and economy, human–computer interaction, and information systems. She is the corresponding author and can be contacted at: preeti.khanna@sbm.nmims.edu.

ENHANCING COMPETITIVENESS IN SERVICE DELIVERY SYSTEMS – ROLE OF TECHNOLOGICAL RESOURCES

Dinesh Panchal

Assistant Professor, Institute of Management, NIRMA University, Ahmedabad, Gujrat, India

Bala Krishnamoorthy*

Business Environment & Strategy, School of Business Management
SVKM's Narsee Monjee Institute of Management Studies
(NMIMS), Mumbai, Deemed-to-be-University, India
E-mail: bala.krishnamoorthy@sbm.nmims.edu
(*Corresponding author)

Abstract:

Technological resources such as Information Systems (IS) play various roles. The purpose of this paper is to determine the contribution of IS Resources in increasing service operation effectiveness (specifically Service Delivery System) as described in Chase and Hayes's Four Stage Model. For this purpose, data were collected from past research. One hundred sixty-six (166) research articles related to Service Competitiveness or Competitive Advantage were referred. The findings of these articles were analyzed and grouped according to the type of IS Resource and its effect on one of the six factors of service operation effectiveness. Based on this data, it was that found that IS Resources have a significant role in increasing the effectiveness of the service delivery system across all six factors. These findings were presented as propositions and summarized as a framework connecting IS Resources with six factors of service operation effectiveness. This finding will help managers and academicians understand the role of IS resources in enhancing service operation effectiveness to

increase overall competitiveness. However, this study is based on past literature. Therefore, the findings are conceptual. The same must be tested before being used in a particular context.

Key words: Information System, Service Operations, Competitiveness

1. Introduction:

The service sector is vital for growing economies to reduce unemployment and advance service diffusion in manufacturing goods (Voss et al., 1997). Survival in the service sector (and, for that matter, in any other industry) is based on building sustainable competitive capabilities (Boonpattarakan, 2012). Hill (2000) also emphasizes the importance of competitiveness, where the author suggests order qualifier and order winner as service priorities. Here, an order qualifier is an entry ticket into the market. However, the order winner is the priority, which makes the firm competitive. To make services competitive, one has to consider four elements: target markets, service concept, competitive strategy, and service delivery systems (Heskett, 1986). Operation aspects of services are covered in the fourth element: the service delivery system. The operation consists of service encounters and activities behind the scenes, i.e., back office activities (Sasser et al., 1978). Therefore, one way to increase a service firm's competitiveness is to manage the service delivery system (Chase & Hays, 1991).

To manage the service delivery system and to increase its effectiveness in terms of contribution to overall competitiveness, researchers have proposed an array of maturity models based on Business Process Management principles (Hammer, 2007; Lee et al., 2007; Rohloff, 2009; Rosemann & de Bruin, 2006; Weber et al., 2008). Hayes and Wheelwright (1984) proposed a four-stage model for strategic management of operations. Subsequently, Chase and Hayes (1991) extended this model for service operation. In Chase and Hayes' Four Stage (CH 4S), the authors proposed four stages for measuring the effectiveness of the service delivery system of a service organization. These stages explain critical operational aspects of service organizations (Chase & Hayes, 1991). Accordingly, the service delivery system of organizations can be Available for Service, Journeyman, Distinctive

Competence Achieved, and World Class Service Delivery. Progressing the service delivery system through these four stages involves a set of choices about factors such as service quality, the role of the back office, customer, technology, workforce, and first-line management (Chase & Hayes, 1991). The author proposed that the overall firm's stage, as per the CH 4S model, is determined from the overall balance among these different factor stages. Drivers for enhancing a firm's competitiveness are the business environment (Mady, 2008), customer needs (Connell, 2010), competitors' actions, as well as internal resources (Murray et al., 2011). A firm uses its unique resources to be competitive and provide superior customer values (Ramaswami et al., 2004).

According to Resource Based View (Peteraf, 1993), organizational competitiveness can be increased by using valuable resources, and these resources are termed strategic resources. There are four requirements for a resource to qualify as a strategic resource: valuable, rare, imperfectly imitable, and non-substitutable (Barney, 1991). Organizations have many strategic resources in finance, human resources, operation, marketing, and information systems. Information and communication technologies are recognized as key tools in management processes, having a remarkable potential to contribute to sustained competitive advantage for businesses. (Qarri and Leskaj, 2011). Many researchers have presented a resource-based view of information system (IS) resources (Santhanam & Hartono, 2003; Wade & Gravill, 2003; Wade & Hulland, 2004). IS resources can provide many benefits to organizations, like improvement in productivity, better decision-making, and effective sourcing (Beheshti, 2004; Devenport, 2005; O'Marah, 2005). IS resources can play three significant roles: administrative, operational, and competitive (King, 1978; Rockart & Scott, 1984).

IS resources can play a role in increasing the effectiveness of the service delivery system across various factors of the service delivery system. IS resources need to be categorized into various sub-categories. Various researchers have classified IS resources differently (Ross et al., 1996; Bharadwaj, 2000; Feeny & Willcocks, 1998). Day (1994) proposed three categories of IS resources: Inside-out, outside in, and spanning. Wade and

Hulland (2004) categorized eight IS resources described in earlier research into these three categories using these categories. These eight resources are External Relationship, Market Responsiveness, IS-Business Partnership, IS Planning and Change Management, IS Infrastructure, IS Technical Skills, IS Development, and Cost-Effective IS Operations. These resources must be deployed in activities or value systems (Porter, 1991) or organization processes (Wade & Hulland, 2004). Six factors included in the CH 4S model can be considered as organization processes where IS resources are deployed to increase the overall effectiveness of the service delivery system and, in turn, the organization's overall competitiveness. Combining views given by Porter (1991), Wade and Hulland (2004), and the CH 4S model, we can define the role of resources in enhancing the effectiveness of the service delivery system across six factors. These, in turn, will increase overall effectiveness and give service organizations a competitive advantage (Chase & Hayes, 1991).

Past literature on service firms still needs to address issues related to integrated strategy and service characteristics (Ostrom et al., 2010). In addition, it was observed that two service firms operating in almost similar environments perform differently, which may be due to the mechanisms these firms deploy to create their unique service offerings (Voss et al., 2008). Few studies have considered the central role of efficiency in service organizations by taking various models as a basis. For example, the customer contact model (Chase, 1978) and the decision-making efficiency model (Charnes et al., 1978) both propose various ways to protect the service core (Thompson, 1967) to enhance efficiency. These models help understand the organization and operation of service firms but need to provide a level of analysis sufficient to examine firms' competitive actions. Past literature has acknowledged the importance of linking firm strategies with specific operation priorities (Skinner, 1969), aligning product lifecycles, business functions, and operations (Dasu & Chase, 2010; Allmendinger & Lombreglia, 2005) applying operation management principles to services (Schmenner, 1986, 2004). However, more than all these studies are needed to capture the details of services that generate competitive advantage.

Regarding the role of IS resources in enhancing the competitiveness of service organizations, past literature is limited to suggesting models and frameworks based on various theories such as Resource Based View (Santhanam & Hartono, 2003; Wade & Gravill, 2003), Knowledge-Based View; also few researchers have focused on ensuring good alignment between IS and business (Bergeron et al., 2004; Marchand, 2005). On the other hand, very few studies have been conducted based on the CH 4S model. All these research studies show that the role of IS resources in increasing organization competitiveness by enhancing the effectiveness of the service delivery system (based on the CH 4S model) needs to be explained. This paper aims to fill this gap by fulfilling the following objectives.

Objective-1: To find out the role of information system resources in enhancing the effectiveness of service delivery systems across six factors as mentioned by Chase and Hayes (1991).

Objective-2: Based on these findings, propose frameworks explaining the contribution of information system resources to enhance the effectiveness of the service delivery system.

The paper is organized as follows. Section 2 provides a brief overview of the theoretical background of the role of resources, the CH 4S Model, and an understanding of various organization resources covered in past literature. In section 3, based on past literature, we attempt to determine the roles played by ISR and classify these findings as per ISR classification and applicability of these to three transitions of service delivery system effectiveness across six factors as per CH 4S. All these findings are summarized in Section 4 in the form of the framework as an aid for a service organization to move from Stage 1 to Stage 4 as per the CH 4S model. Section 5 covers the conclusion and areas of further research of this study.

2. Theoretical Background:
2.1 Role of Resources to Gain Competitive Advantage:

Resource-Based View: Barney (1991) argues that to provide a competitive advantage, a resource must fulfill four criteria:

1. Valuable: The resource must have strategic value to the firm (for example, by exploiting opportunities or neutralizing threats).
2. Rare: The resource must be unique or rare to find among the current and potential competitors of the firm.
3. Imperfect imitability: It must not be possible to perfectly imitate or copy the resource (because it is difficult to acquire; because the link between the capability or the achieved sustained competitive advantage is ambiguous; or because it is socially complex).
4. Non-substitutability: Competitors cannot substitute the resource with another alternative resource to achieve the same results.

National Competitiveness (Porter, 1985): The stages through which national competitiveness develops are factor-driven, investment-driven, innovation-driven, and wealth-driven. The initial three stages are indicators of an increase in competitiveness. However, the last stage indicates a reduction in competitiveness. From a resource perspective (Porter, 1985) resource-dependent industries like manufacturing are falling in factor-driven competitiveness.

Drivers for Sustainable Competitive Advantage (Porter, 1991): In this paper, Porter explained how organization drivers contribute to sustainable competitive advantage and ultimately firm success. As per this model, organizations deploy their strategic resources (drivers) in activities/value systems. This in turn gives a sustainable competitive advantage. This model implies that organizations get benefits such as good performance through competitive advantage generated by strategic resources via activities/value systems. Refer Fig 2.1.
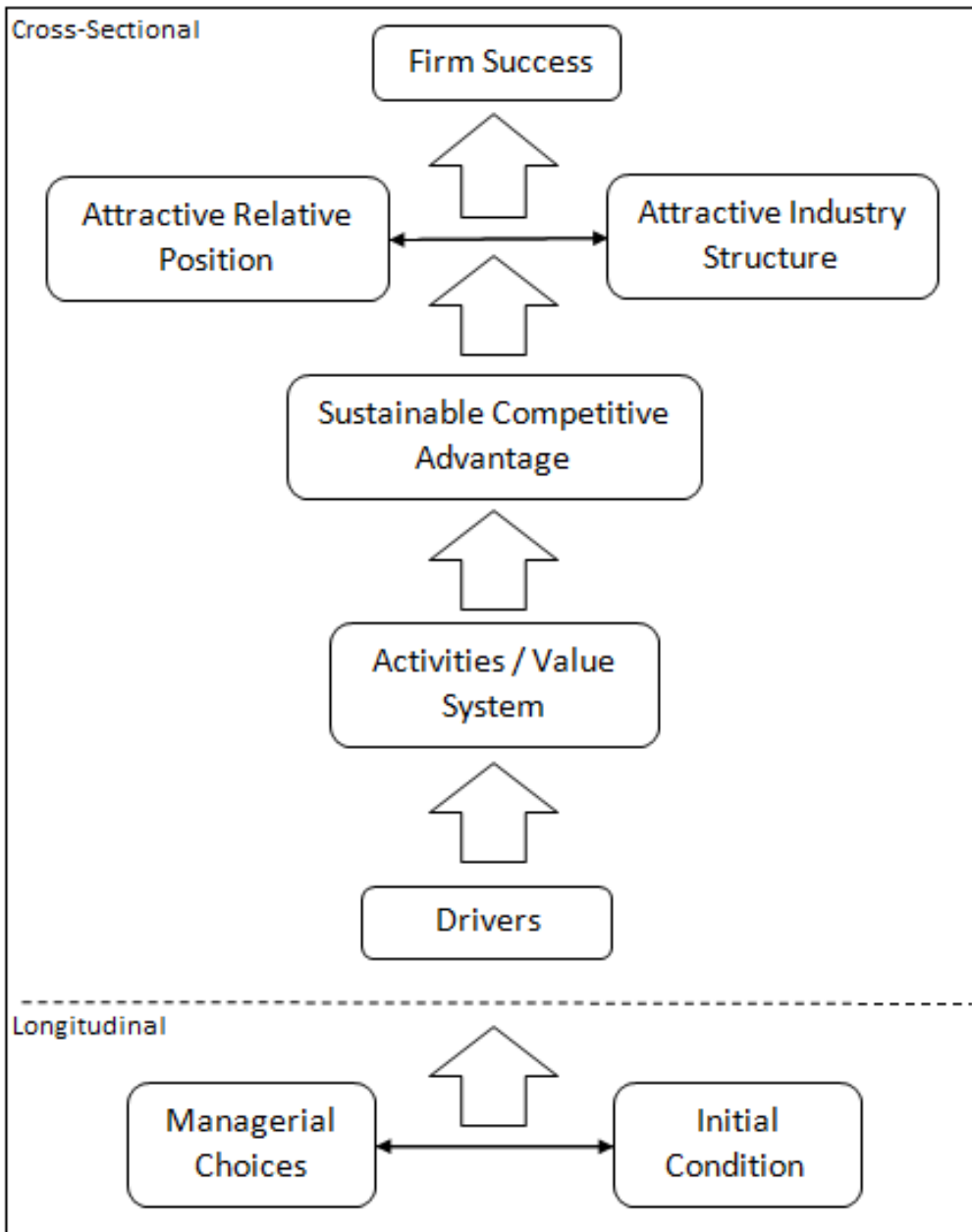
Fig: 2.1 Roles of Organisation Drivers for Firm Success (Porter, 1991)

2.2 Effectiveness of Service Delivery System:

As per the CH 4S model (Chase and Hayes, 1991) effectiveness (in terms of contribution to the competitiveness of service organization) of the service

delivery system can be increased in the organization through the following four stages.

Table: 2.1 – Four Stages of Service Firm Competitiveness (Chase and Hayes, 1991)

Stage	1. Available for Service	2. Journeyman	3. Distinctive Competence Achieved	4. World Class Service Delivery
	Customers patronize service firm for reasons other than performance.	Customers neither seek out nor avoid the firm.	Customers seek out the firm based upon its sustained reputation for meeting customer expectations.	The company's name is synonymous with service excellence. Its service doesn't just satisfy customers, it *delights* them, and thereby expands customer expectations to levels its competitors are unable to fulfill.
	Operations is reactive, at best.	Operations functions in a mediocre, uninspired fashion.	Operations continually excels, reinforced by personnel management and systems that support an intense customer focus.	Operations is a quick learner and fast innovator; it masters every step of the service delivery process and provides capabilities that are superior to competitors'.
Service Quality	Is subsidiary to cost, highly variable.	Meets some customer expectations, consistent on one or two key dimensions.	Exceeds customer expectations, consistent on multiple dimensions.	Raises customer expectations and seeks challenges, improves continuously.
Back Office	Counting room.	Contributes to service, plays an important role in the total service, is given attention, but is still a separate role.	Is equally valued with front office, plays integral role.	Is proactive, develops its own capabilities, and generates opportunities.
Customer	Unspecified, to be satisfied at minimum cost.	A market segment whose basic needs are understood.	A collection of individuals whose variation in needs is understood.	A source of stimulation, ideas, and opportunity.
Introduction of New Technology	When necessary for survival, under duress.	When justified by cost savings.	When promises to enhance service.	Source of first-mover advantages, creating ability to do things your competitors can't do.
Workforce	Negative constraint.	Efficient resource, disciplined, follows procedures.	Permitted to select among alternative procedures.	Innovative, creates procedures.
First-Line Management	Controls workers.	Controls the process.	Listens to customers, coaches and facilitates workers.	Is listened to by top management as a source of new ideas. Mentors workers to enhance their career growth.

Progress of an organization's service delivery system to become world-class is a journey along two dimensions: increasing its strategic impact and increasing operation capability. Resulting in three transitions as shown in Fig 2.2.
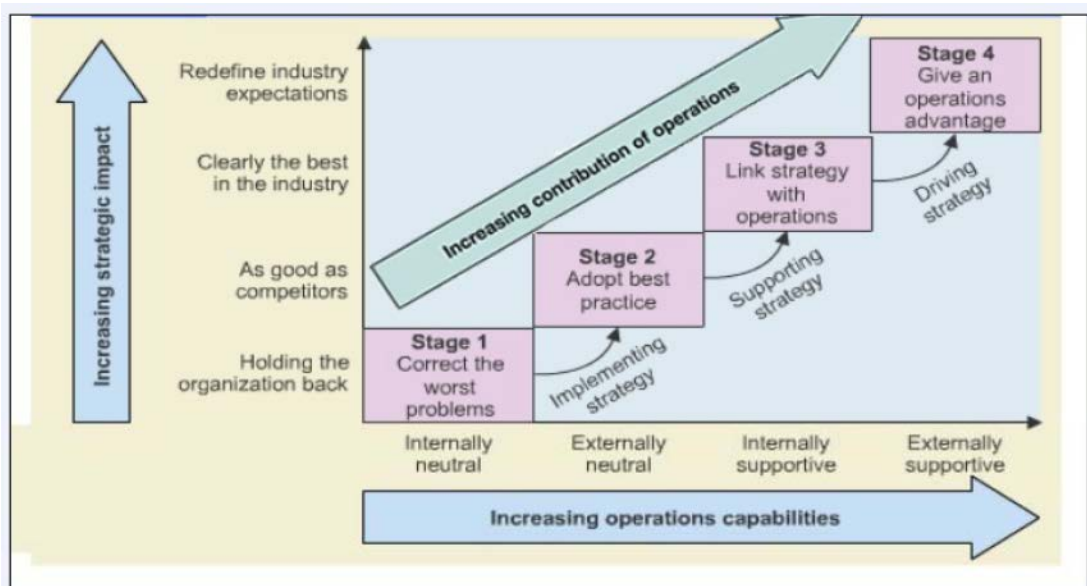
Fig: 2.2 Hay and Wheelwright Four Stage Model for Strategic Manufacturing Effectiveness (Pycraft et. al., 2007).

These transitions are

- Stage-1 to Stage-2: Implementing Strategy (IS)
- Stage-2 to Stage-3: Supporting Strategy (SS)
- Stage-3 to Stage-4: Driving Strategy (DS)

However as advised in the CH 4S model, these transitions should be ensured uniformly across six factors as mentioned in Table 2.1.

Combining three transitions and six factors, the organization has to ensure the following eighteen transitions from Stage-1 to Stage-4.

Table: 2.1 – Transitions of Service Firm Competitiveness

Factors	Stage-1 to Stage-2 (Implementing Strategy)	Stage-2 to Stage-3 (Supporting Strategy)	Stage-3 to Stage-4 (Driving Strategy)
Service Quality (SQ)	SQ-12	SQ-23	SQ-34
Back Office (BO)	BO-12	BO-23	BO-34
Customer (CS)	CS-12	CS-23	CS-34
New Technology (NT)	NT-12	NT-23	NT-34
Workforce (WF)	WF-12	WF-23	WF-34
First-line Management (FM)	FM-12	FM-23	FM-34

For example, SQ-12 means increasing the effectiveness of service quality to a level where service quality can contribute to implementing organizational strategy. Similarly, SQ-23 is a transition in which service quality effectiveness is increased to a level that can support the organization's strategy. Finally, SQ-34 designates a stage where the organization's service quality has become excellent, and at this stage, service quality can drive the organization's strategy.

2.3 Classification of Information System Resources:

Researchers suggested various resource classifications in the past (Penrose, 1959; Itami, 1987). Marr et al. (2004), in their study to map intellectual performance drivers, presented a comprehensive classification of resources based on past literature. In this classification, the following seven categories are used.

   a) Finance: Cash
   b) Physical: Plant & Equipment, Natural Resources, Technology, Structure, layout and locations

c) Relationship: Customer, Supplier, Network Partner, Investor
d) Human Resource: Knowledge, Skills Experience and Competence, Commitment, Motivation and Loyalty, Creativity, Education, and Attitude
e) Culture: Value System, Decision-Making Pattern, Common Way of Seeing and Doing Things
f) Practices: Processes, Flow of Information, Specialization, Tacit Rules
g) Intellectual Property: Patents, Trade Secrets, Trade Marks, Registered Designs, Copyrights, Brands

The above classification is aimed at all types of industries. For service industries, Bhardwaj et al. (1998) presented a comprehensive view of resource classification, which comprises of, scale; cost and demand synergies; product, process, and managerial innovations; brand equity; relationships/procurement contracts; spatial pre-emption; communication sound effects; corporate culture; organizational expertise; producer learning; experience effects; information technology; innovation, quality, and customer service-related skills; functional skills and implementation skills.

Similarly, for IS resources, researchers have proposed various classifications (Leonardo-Barton, 1992; Teece et al., 1997). The classification given by Day (1994) considers IS resources in three processes: inside-out, outside-in, and spanning. Inside-out resources are deployed in response to outside requirements and opportunities and are mostly internally focused. In contrast, outside-in resources are externally focused. Outside-in resources give importance to anticipating market requirements, creating durable customer relationships, and understanding competitors. Finally, spanning resources are those which involve both internal and external analysis. They are required for proper integration of inside-out and outside-in resources. Using these classifications, Wade and Hulland (2004) presented a comprehensive classification of resources based on past literature in their review of the resource-based view in information system research. In this classification, the following eight categories were used.

Manage External Relationship: Manage external linkage, Manage stakeholder relationships, Strong community networks, Contract facilitation, Informed buying, Vendor development, Contract monitoring, Coordination of buyer and supplier, and Customer service.

a) Market Responsiveness: Fast delivery, Ability to act quickly, Increased market responsiveness, Fast product life cycle, Capacity to frequently update information, Strategic flexibility, Flexible information system, Organisation flexibility.

b) IS-Business Relationship (Internal Relationship): Integrate IS and business process, Capacity to understand the effect of IS on other business areas, IS-Business partnership, Aligned IS planning, Business / IS strategic thinking, IS/Business synergy, IS assimilation, Relationship building, IS/Strategy integration.

c) IS Planning and Change Management: IS management skills, Business understanding, Problem-solving orientation, Business system thinking, Capacity to manage IS change, Information management practices, Managing architecture/standards, and Architecture planning.

d) IS Infrastructure: IS infrastructure, Proprietary technology, Hard infrastructure, Soft infrastructure, Storage and transmission assets, Information processing capacity, Technology assets, and Information technology practices.

e) IS Technical Skills: Technical information technology skills, Knowledge assets, Using knowledge assets.

f) IS Development: Technical innovation, Experimentation with new technology, Capacity to develop service that utilizes interactive multimedia, Alertness.

g) Cost-Effective IS Operation: Cost-effective operation and support, Getting IT to function, and enhancing product quality.

This classification covers all the categories of general and service resources classification. Hence, the classification proposed by Wade and Hulland (2004) was used for this study.

3. Strategic Role of Information System Resources:

To find out the strategic role of ISR following process was used
   a) Define resource classification (Refer to Section 2.3)
   b) Define Six Factors of the Service Operation Delivery System and their Transition Stages (Refer to Table 2.2)
   c) Find past literature related to IS Resource effect on service competitiveness
   d) Classify them as per IS Resource Classification and Effect on Six Factors of Service Operation Delivery System
   e) Preposition based on the above findings and classification
   f) Develop a framework to represent these propositions

In this study, we have used information from past literature related to the role of IS resources in increasing the competitiveness of service organizations. From the research databases EBSCOhost, ProQuest Central, and JSTOR, all articles with titles containing words "service" and "competitiveness" or with titles containing words "service" and "competitive advantage" were considered. However, for this study focused on IS resources, only those findings were included related to the effect of IS resources on competitiveness or competitive advantage. The total number of articles referred for this information collection is 166 (with ProQuest Central: 98 nos, EBSCOhost: 8 nos, and JSTOR: 60 nos). Refer to Annexure – 1 for a compilation of these findings. This table lists findings from past literature under the column "Contribution of IS Resource." These findings are classified as per the resource classification suggested by Wade and Hulland (2004) under the column "Information System Resource." These findings were tagged as per "Categorization for Effect on Six Factors" to connect these contributions for their role to increasing competitiveness via increasing effectiveness of the service delivery system.

Coders classified the data, and IT and service domain experts authenticated the codes. The coder profile included IT or Computer Engineering as an essential qualification and ten years of experience in related fields.

After the categorization inter-coder reliability was tested using the following formula as suggested by North et. al. (1963).

$$R = \frac{2\,(C_{1,2})}{C_1 + C_2}$$

Here,

$C_{1,2}$ Number of Category Assignments Both Coders Agree on
C_1 Number of Category Assignments Done by Coder-1
C_2 Number of Category Assignments Done by Coder-2

Since in this study, three coders were involved hence total of three Inter-Coder Reliability (ICR) were computed, as summarized in the table below

Table – 3.1 Inter-Coder Reliability

Sr. No	Coder Pair	ICR – Resource Type	ICR – Effect on Six Factors of Service Delivery
1	C_1 and C_2	40%	36%
2	C_1 and C_3	43%	40%
3	C_2 and C_3	33%	45%
Average		**39%**	**40%**

From the above table, it is observed that inter-coder reliability is on average 40%. As the number of categories were more, the probability of differing from each other increases in such cases. Hence these reliabilities were considered to be in the acceptable range and coding done by these coders was considered for establishing connections between resource types and the effect on six factors of service delivery. However, only those codes were considered (for

establishing a connection between resource type and effect on six factors of service delivery) where there was agreement in coding between two or more coders. This classified information was considered for proposing a few hypotheses and presenting them as a framework as discussed in the next section.

4. Framework to Enhance Effectiveness of Service Delivery System:

From Annexure - 1, all the contribution and their cause-effect relationship between IS Resources and Service Delivery System Factors (as per the CH 4S model) are expressed as the following propositions

- Propositions-1: ISR – Managing External Relationships affects Back Office Operation, Customer and First-Line Management for increasing Service Operations Competitiveness.

- Propositions-2: ISR – Market Responsiveness has an effect on Service Quality, Back Office operation, Customers, and Workforce for increasing Service Operations Competitiveness.

- Propositions-3: ISR – IS-Business Relationship has an effect on Service Quality for increasing Service Operations Competitiveness.

- Propositions-4: ISR – IS Planning and Change Management has an effect on Workforce and First-Line Management for increasing Service Operations Competitiveness.

- Propositions-5: ISR – IS Infrastructure has an effect on Service Quality and New Technology for increasing Service Operations Competitiveness.

- Propositions-6: ISR – IS Technical Skills have an effect on Service Quality and First-Line Management for increasing Service Operations Competitiveness.

- Propositions-7: ISR – IS Development has an effect on New Technology for increasing Service Operations Competitiveness.

- Propositions-8: ISR – Cost Effective IS Operation has an effect on Service Quality and Back Office Operations for increasing Service Operations Competitiveness.

All these propositions are summarized in the proposed framework for depicting the effect of IS Resources on increasing the strategic effectiveness of Service Delivery System Factors as shown in Fig: 4.1
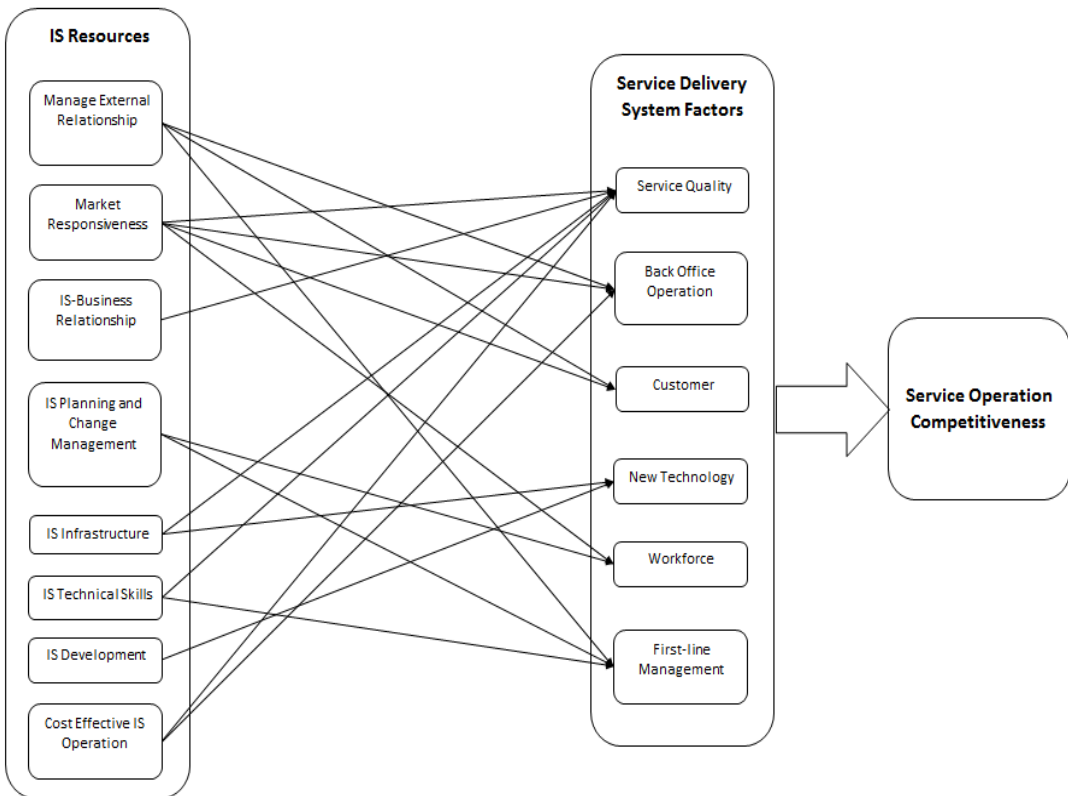
Fig 4.1: Effect of IS Resources on Strategic Effectiveness of Service Delivery System

Based on the above preposition and framework, it can be inferred that IS Resources have many effects on increasing service operation competitiveness. However, past literature is not supportive uniform across all six factors for this conclusion. As can be seen from Table 3.1, many studies have confirmed some parts of this framework. However, for balance linkages, very few studies have given concurrences. This part needs to be considered while applying this model for practical purposes.

5. Conclusion:

5.1 Summary

Based on past literature it is observed that IS Resources do have significant role in increasing effectiveness of service delivery system across all six factors of CH 4S Model. These relationship was established based on IS Resource classification in to eight categories and then finding out effect of these eight type of resource in increasing effectiveness of service operation delivery system through six factors. Hence linkages shown in Porter's model between Drivers – Activities – Sustainable Competitive Advantage is conceptually proved. However, this finding needs to be supported through empirically data for specific industry sector and in general.

5.2 Managerial Implication

Following implications are offered to manager and practitioners through this study.

a) Understanding role of IS Resource for enhancing service operation effectiveness to increase overall competitiveness

b) Identify and focus on appropriate IS Resource role at various stages of service operation effectiveness and across different factors of service operation effectiveness as per CH 4S model

5.3 Future Scope of Study

a) Empirical testing of this framework

b) Similar study for specific service industry sector and that needs to be empirically tested

c) Similar framework can be proposed for manufacturing and same to be empirically tested for various service sectors

6. References:

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Annexure – 1: Contribution of Information System Resource

Information System Resource	Contribution of IS Resource	Categorization for Effect on Six Factors
1) Manage External Relationship:		
Manage external linkage		
Manage stakeholder relationship	Smith and Rupp (2002): Having business solution partnership with customers	Customer
	Drazen (2007): CRM's impact on competitiveness	Customer
	Dos et .al. (2009): Relationship marketing to improve competitiveness	Customer
	Liu et. al. (2010): Managing relationship for better service quality	Customer
	Ljubojevic and Vetro (2011): Relationship between customer and service organization is the basis of everything else to gain CA	Customer
Strong community networks	Chen and Hsieh (2008): Vertical and horizontal relationship as constituents of CA	No clear classification
Contract facilitation		
Informed buying		
Vendor development	Song (2011): Resource supply capability is important for CA	

Information System Resource	Contribution of IS Resource	Categorization for Effect on Six Factors
Contract monitoring	Thompson (1995): Better business arrangement and contract vehicle results in to good performance	First-Line Management
Coordination of buyer and supplier	Yao and Ping (2009): Integrate customer and suppliers for to raise CA	Back Office
Customer service	Greenberg (1990): Gaining competitiveness through customer service	Customer
	Bazan (1998): Better customer services and satisfaction leads to competitive advantage	Customer
	Maclaran and McGowan (1999): Customer care and service quality as important elements of CA	Customer
	Prager (2003): CA through customer service training	Customer
	Yao and Ping (2009): Information System for better customer services to raise CA	Customer
	Carrick (2010): CA through customer services	Customer
2) Market Responsiveness:		

Information System Resource	Contribution of IS Resource	Categorization for Effect on Six Factors
Fast delivery	Lindahl and Beyers (1999): Flexibility and timely delivery help to get CA	Back Office
	Kongkiti and Rapee (2008): Service delivery is the new priorities of CA	Back Office
Ability to act quickly		
Increase market responsiveness	Clow and Vorhies (1993): Measuring customer expectations for improving service quality	Customer
	Devlin and Ennew (1997): Niche players make use of market driven arenas and competitive advantage	Customer
	Lindahl and Beyers (1999): Cover broader scope gives CA	Customer
	Smith (2000): Consumers as source of information and value added inputs for good benchmarking process	Customer
	Bergeron et. al. (2008): Customer orientation as antecedents of CA	Customer
Fast product life cycle	Narsimhan (2004): Creating CA through new service development	Service Quality

Information System Resource	Contribution of IS Resource	Categorization for Effect on Six Factors
Capacity to frequently update information	Nayyar (1990): Information asymmetries as source of competitive advantage.	Customer
Strategic flexibility	Devlin (2001): Consumer evaluation and CA	Customer
Flexible information system		
Organisation flexibility	Enderwick (1990): Organizational flexibility and labor exchangeability as critical factor for competitiveness	Back Office
	Richardson (1995): Involvement and participation of all staff contributes to competitive advantage	Workforce
	Seggie and Griffith (2008): Alignment of organization resource with customer needs	Customer
3) IS-Business Relationship (Internal Relationship):		
Integrate IS and business process		
Capacity to understand the effect of IS on other business areas		
IS-Business partnership		
Aligned IS planning		
Business / IS strategic		

Information System Resource	Contribution of IS Resource	Categorization for Effect on Six Factors
thinking		
IS/Business synergy		
IS assimilation		
Relationship building		
IS/Strategy integration	O Farrell et. al. (1993): Good fit between strategy and competitive advantage is must for better performance	No clear classification
4) IS Planning and Change Management:		
IS management skills	Kontoghiorghes (2003): Organization should invest in enhancing employee commitment for gaining CA	Workforce First-Line Management
Business understanding		
Problem solving orientation		
Business system thinking		
Capacity to manage IS change		
Information management practices		
Manage architecture/standards		
Architecture planning		
5) IS Infrastructure:		
IS infrastructure	Johnson and Anuchit (2002): Tengibles are an important aspect of service quality	Service Quality
Proprietary technology		

Information System Resource	Contribution of IS Resource	Categorization for Effect on Six Factors
Hard infrastructure		
Soft infrastructure		
Storage and transmission assets		
Information processing capacity		
Technology assets	Enderwick (1990): Technology is helping Japanese service firm to be competitive	New Technology
Information technology practices		
6) IS Technical Skills:		
Technical information technology skills		
Knowledge assets	Sverko and Benazic (2011): New knowledge to achieve certain CA	Service Quality
	Gonzales and Schiuma (2015): Sustained CA through knowledge	Service Quality
Using knowledge assets	Boxall (2003): Human resources have broader advantage for success full service operations	First-Line Management
7) IS Development:		

Information System Resource	Contribution of IS Resource	Categorization for Effect on Six Factors
Technical innovation	Lindahl and Beyers (1999): Creativity and technical innovation helps to gain CA	New Technology
	Kontoghiorghes (2003): Organization should invest in innovations for gaining CA	New Technology
	Narsimhan (2004): Creating CA through innovation	New Technology
	Chen and Watanabe (2008): Innovation as new dimension competitiveness	New Technology
	Qarri and Bazini (2011): Innovation supported by ICT to gain efficiency and CA	New Technology
	Cho et. al. (2012): Innovation protection mechanism for getting advantage out of innovations	New Technology
Experimentation with new technology		
Capacity to develop service that utilizes interactive multimedia		
Alertness		
8) Cost Effective IS Operation:		

Information System Resource	Contribution of IS Resource	Categorization for Effect on Six Factors
Cost effective operation and support	Lindahl and Beyers (1999): CA stems from better price, which is possible with cost effective operations	Back Office
Getting IT to function		
Enhance product quality	Lindahl and Beyers (1999): CA stems from better quality Shepherd (1999): Service quality as prerequisite for success	Service Quality Service Quality

About the Author:

Dinesh Panchal is currently working as an Assistant Professor at Institute of Management, Nirma University. Earlier, he has worked with Navrachana University, Vadodara, India as Head – Center for Professional Education and with SVKM's NMIMS as an assistant professor in the School of Technology Management. Dinesh has completed his Ph.D. in Business Models from SVKM's NMIMS – School of Business Management. He has 16 years of industrial experience and 9 years of academic experience. His areas of interest include Business Models, Manufacturing Management, Technology Management, and Analytics in Supply Chain-Management.

Bala Krishnamoorthy is a Professor at the School of Business Management, NMIMS. Dr Bala contributes to management research with articles in highly reputed journals listed in ABDC List and Scopus indexed with high impact factors. She guides and examines PhD doctoral students in Strategic Management with diversified sectors. At SBM, NMIMS 10 students have been awarded Ph.Ds. with her guidance. She has written a book on Environmental Management with Prentice Hall (2017). Her cases are published by the Ivey case publishing house, Emerald Emerging Market Case Studies, and the Case Centre. She has published 45 articles in the last five years (2017 -2022). In the last five years 2018-2023, she has published more than 26 Scopus-indexed articles in ABDC listed Journals. She is the corresponding author and can be contacted at bala.krishnamoorthy@sbm.nmims.edu.

AI IN RECRUITMENT AND SELECTION: A GUIDING MANUAL

Manjari Srivastava*

HR & Behavioural Sciences, School of Business Management,
SVKMs NMIMS Deemed-to-be University, Navi-Mumbai, India
E-mail: manjari.Srivastava@sbm.nmims.edu

Monika Sharma

School of Technology Management
SVKM's Narsee Monjee Institute of Management Studies
NMIMS Deemed-to-be-University, Navi-Mumbai, India.

Abstract: *The rapid evolution of technology, particularly the era of Artificial Intelligence (AI), has significantly influenced the labor market and revolutionized Human Resource Management (HRM). This comprehensive document delves into the profound ramifications of AI in Recruitment and selection. It acknowledges AI's potential to bolster productivity, streamline operations, and generate new employment opportunities. It also provides valuable insights into the selection of suitable AI-driven HR recruitment tools based on organizational requirements and the diverse functionalities these tools offer. The finding suggests that the most of the tools provide the initial process of screening resumes and selecting suitable candidate. Very few products provide the features of interview transcriptions and automatic analysis to check the suitability of the candidate. Challenges associated with AI implementation in HRM, such as data prerequisites, biases, data authenticity, scalability, and security issues, are examined thoughtfully.*

Key words*: AI-Powered HRM Tools, Comparison of tools, tool features, AI recruitment challenges*

1. Introduction

The technological developments have influenced labour market. AI is one of the most powerful technologies dominating the business world that has affected HR practices as well. Strohmeier and Piazza (2015) came up with the concept of AI in HRM. They believed in the future potential of AI techniques in HR functions. With advances of technology, the companies have been bullish about HR automation, making company 'Smart.' However, the impact of AI on HR practices is controversial. The research show that it has led to reduction in jobs, snowballing the social inequity (Berg, Buffie, & Zanna, 2018; Levy, 2018). As reported by The World Economic Forum (2023), "artificial intelligence will replace some 85 million jobs by 2025." As per McKinsey Global Institute report, by 2030 there would be a global shift in careers impacted by development in digitization and AI. Digitization, Artificial Intelligence, Robotics   etc. seems to have many benefits for the future of HRM. It has the potential to enhance efficiency and productivity, create new occupations and job roles. According to Goldman Sachs, "generative AI can raise global GDP by 7%". The impact is seen as positive and significant with huge potential (Budhwar, Malik, De Silva, & Thevisuthan, (2022; Malik, De Silva, Budhwar, & Srikanth, 2021). Digital technologies are on the agenda of organizations for new strategic thrusts and are endorsed for behaving in unconventional ways. The use of social media, machine learning, simulations, artificial intelligence (AI) and augmented reality (AR), big data analytics are now part of regular business activities and decision-making process.

Scholars cite that usage of AI based HR tools depends upon the progress in technical fields while implementation is depends upon knowledge and understanding of social sciences (Berg, et al., 2018; Van Esch, Black, & Ferolie, 2019; Brougham & Haar, 2020).

The recent development show that the field of AI-HRM is likely to see the enormous growth in the coming years. The recruitment, performance, and staffing processes of HRM have gone through a rapid change in terms of utilization of AI based tools (Benabderrahmane, Mellouli, & Lamolle, 2018; Faliagka et al., 2014). AI based tools are being applied by industry to facilitate

interview processes, detecting candidates personalities, communication skills, benchmarking candidates with current employees, predicting future performances, studying job seeking behavior and matching candidates, talent engagement. The usage of technology is towards training and development, employee wellbeing seems to be considerably low as compared to other areas of HRM (Yuan Pan and Fabian J. Froese, 2023). Researchers have also found that in various cases, employees are unprepared both mentally and at skill level to use AI in HR related processes. Companies must take initiative in integrating AI into HR processes. The integration would be possible if only there is open-minded culture and other socio-technical support provided to the employees. (Makarius, Mukherjee, Fox, & Fox, 2020;).

The interface between AI enabled devices and employees be managed by having a careful communication, maintaining collaborative spirits, training support to enhance competence level and connecting it with future performance of employees. For example, in a study on,' artificial intelligence and team interaction', it was found that, before organizing the working of teams with robots, organization first provided it workforce a training to develop the technological competence and this led to the success of the project. They also came across another challenge of performance evaluation where humans and AI (robots) work together. (Arslan A. et. al,2021).

2. Application of AI and HRM practices

AI indeed encompasses a wide range of technologies that enable computers to perform tasks that typically require human cognitive abilities (Strohmeier and Piazza, 2015; Malik et al., 2020, Mehrotra and Khanna, 2022). Studies by researchers show that for example,

i. Data mining for employee selection: AI can analyse large datasets to identify trends and correlations related to successful employees. This can help HR professionals in taking right decisions when selecting candidates for a job, potentially leading to better hiring choices.

ii. Recruitment via Social Networking Sites: AI can streamline the recruitment process by analysing social media profiles and data

extraction tools to identify potential candidates. This approach allows HR teams to identify candidates having desired skills and cultural fit.

iii.   On boarding: AI-powered chatbots can guide new joiners for the on boarding process, answer their questions, and give them with important information.

iv.   Intelligent Agent Technologies for Employee Development: AI-powered intelligent agents can provide personalized learning and development opportunities for employees. These agents can adapt to an individual's needs and preferences, helping them acquire new skills and knowledge more efficiently.

v.   Employee Engagement: AI can analyse feedback from employees through pulse surveys, helping HR identify and address issues related to employee satisfaction and engagement. AI tools can suggest and facilitate employee recognition programs to boost morale.

vi.   Evaluating Performance and feedback: AI can provide more objective performance evaluations by analysing data and removing potential biases. It can also offer feedback and coaching based on performance data.

vii.   Workforce Planning, retention and attrition prediction: catering to future staffing needs, AI uses predictive analytics for work-planning, and succession planning. It is also useful in analysing historical employee data to identify factors contributing to attrition and suggest preventive actions.

viii.   Employee Well-being: AI can suggest and manage well-being programs and activities, considering individual employee needs. In case of handling conflicts AI-driven NLP can help HR professionals understand and address employee concerns and conflicts more effectively.

ix.   Smart Sensory Mechanisms for Employee Productivity and Knowledge Detection: AI can be used to assess employee productivity through

sensors and data analytics. It can also be employed to identify knowledge hiding within an organization, helping to address issues related to knowledge management and sharing.

x. Compliance and Risk Management: For monitoring and ensuring compliance with labour laws and regulations AI based tools are great assistance in analysing HR data for potential violations.

It is important to note that while AI can bring significant advantages to HRM, it should be implemented thoughtfully, with a focus on ethical considerations, transparency, and privacy, to ensure that it benefits both organizations and employees. Additionally, AI in HRM works best when it complements human expertise rather than replacing it entirely.

3. AI in Recruitment and Selection

Amongst the plethora of HRM practices, AI based technologies have found most favored place in recruitment and selection. Some of the most common digital platforms like Facebook, LinkedIn have been adopted because of its feasibility process in finding potential candidates.

Recruitment is understood as a process of searching, attracting and selecting of people for job (Chiavenato, 2005). The process identifies the qualified talent within or outside the organization to fill job vacancy effectively and efficiently. According to Milkovich and Boudreau (1994), it is a two-way communication process as candidates require appropriate information for job application and organization would like to know the kind of employee they would be applying for the vacancy. Therefore, there is a communication signal from both the sides requiring reliable information. Over the years, the recruitment methods have garnered much attention and influenced by the technological developments with respect to digitization in business practices. Recent recruitment practices show that job seekers and recruiters are increasingly using AI in the candidate recruitment. According to a research finding, most of the recruiter feels that selecting the appropriate applicant from the large pool of data is more challenging in hiring process. This is because of the misaligned resumes for the positions advertised. Shortlisting a

single hire may take up to 23 hours." (Cited by Mehrotra and Khanna 2022). Mehrotra and Kahnna (2022), quoting Johansson J, Herranen S.(2019), in their research highlights the role of AI in streamlining and automating various aspects of recruitment and this process is very similar to human intelligence and behaviour. Researchers find that using AI in talent acquisition process enhances positive experiences. The series of tasks related to initial planning, to on -boarding, have become efficient and easy (DiRomualdo A, et al2018; Deshpande 2018; Mehrotra and Khanna, 2022).

For the recruitment process effectiveness, making a choice of the appropriate tool is important. The significance of such tools can be realized, as AI-based tools have become a game-changer in the recruitment process. They not only improve the quality of the hires but also optimize the entire recruitment workflow. However, this technological advancement has also introduced a plethora of options, making it challenging to select the right tools that align with the organization's goals and needs. There exists a strong need to identify the appropriate tool that fulfills the organizations' recruitment objective.

The "HR Recruitment Process Tool Selection Guide" assist HR professionals, talent acquisition specialists, and decision-makers in navigating the complex and diverse world of AI-based tools for recruitment. Authors presents a recommendation for tool selection in the following section.

4. A Comprehensive Tool Selection Guide for AI Based Recruitment
This comprehensive guide includes the key factors to consider when evaluating AI-based HR recruitment tools.

Understanding organization's needs is the first step while considering employing AI based tools. Every organization has some recruitment goals and objectives like reducing time-to-hire, improving candidate quality, or enhancing the overall recruitment process. At the same time, it is important to relook the existing system and its challenges. Some guiding interrogation could be struggling with candidate sourcing, candidate engagement, or other aspects of the recruitment workflow.

Volume of Recruitment should also be taken in to consideration as the high-volume recruitment may require more automated sourcing and screening capabilities. Key skill set and the qualification for various positions must be determined while taking the decision about an automated tool. Tools can help in assessing and evaluating the candidates based on the required skill set and the qualification. Data sources from where tools are gathering the data and using for various purposes at different stages of recruitment also play the vital role hence the data sources claimed by different tools needs to be checked thoroughly. Integration needs should be considered in this sequence to ensure the integration of existing data, processes and tools as well. This will be important to smooth shift on another tool without losing the existing data and ease of achieving the desired task. One should understand the existing HR technology stack, including current acquisition and talent selection tool and evaluate how seamlessly new tool can integrate with these systems.

Data privacy is another important concern while selecting the new software. If data privacy and compliance are paramount, assess new software's data security measures and its adherence to legal regulations before moving ahead. It is advisable to analyze the organization's long-term requirement and strategies to judge the Return of investment on purchasing any services or software tools for recruitment purposes. One should consider both upfront costs and ongoing expenses and ensure that the tool must align with these strategic goals and can scale with the future needs.

Once organization's needs for recruitment are explored, the next step is finding the tool that aligns with the requirement. Understanding the feature and functionality of the tool is paramount.

4.1 Features and Functionality: The AI tools offers various features and functionalities such as resume screening, candidate matching, interview scheduling, and data analytics. Common features which are mainly applicable to vast range of tools could be automated candidate sourcing, resume parsing and analyzing, candidate matching, personalized messaging, automated job posting, candidate engagement tracking, and creation of work flow based on

organization specific requirement. Selecting the right AI-based HR recruitment tools is not only a strategic move but also a reflection of the organization's commitment to staying competitive and efficient in a talent-driven market.

In the following sections, we will explore these key considerations in detail with respect to various available tools in the market to provide judgmental capabilities to the readers. Comprehensive comparison tables for various tools provide the reader a required knowledge and resources necessary to make informed decisions when choosing AI-based tools for their HR recruitment process.
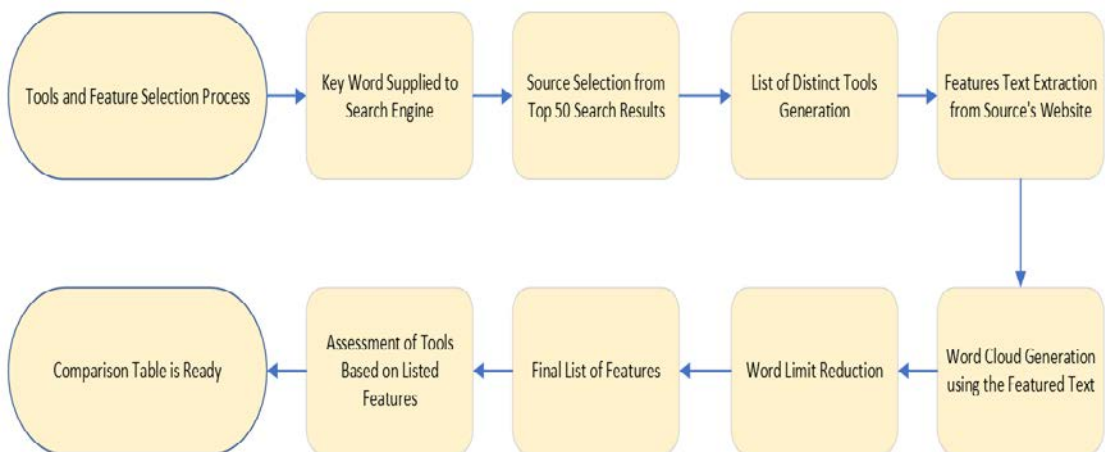
Figure 1. Showing Flowchart of the Tools and Features Selection (author's representation)

The process starts with the keyword containing the words ***"Tools/Software Based on AI for HR recruitment and selection process"*** given to the popular search engine "Google". As a result, many sources were obtained and to avoid biases towards source selection, blogs were included in the sample. These blogs on AI Based tools offered a comparison of tools available in the market. The search engine threw up a data of 100 such sources. Out of first 100 sources the top 50 search results were included in the study. Finally, to avoid the biases as mentioned above, the eight distinct sources were obtained from the above set of results. The selected sources are Clickup, AnalyticsVidya, linked-

in, edume, recruitee, wellable, zavvy and renaissancerachel. These sources represent blogs, portals and professional social media platforms. All the tools extracted from these sources were further analyzed. The applicable vital features of these tools were extracted from the source's official websites. After extraction these words were supplied to the word cloud generator tool (https://www.freewordcloudgenerator.com). Here the word limit was set as 50. Prominent features appeared in the word cloud were picked and finalized to compare these tools as shown in figure two.

Figure 2. Showing The Word Cloud (author's representation)

Final features were picked based on the frequency and relevance and these are "Candidate sourcing and Matching, Candidate engagement, Talent Acquisition, Talent relationship management, Automated hiring process, Job listing, Interview scheduling, Predictive analytics, Recruitment marketing, Pipeline management, Performance Management, Employee onboarding, skill assessment, Chat-Bot".

4.2 Description of Feature

Candidate sourcing and Matching: Candidate sourcing is a vital aspect of talent recruitment. The AI through data driven methodology facilitates

candidates sourcing via job portals, social media and various professional networks. Once the pool of qualified candidates is ready, AI algorithm help in assessing the compatibility as per the job roles requirement by the organizations.

Candidate Engagement: This call for actively engaging the applicants by maintaining a positive interaction between the applicants and organizations. AI algorithms caters to the process by maintaining continuous positive communication.

Talent Acquisition: Talent acquisition entails the process of recognizing, enlisting, and including all those potential candidates who meet the organizations requirements for present and the future. The range of tasks start from developing recruitment strategies, steering the selection processes, creating the visibility of the organization with positive employer brand, on boarding process, including the governance process, the ethical and legal adherence. It also takes account of emerging trends in the field.

Talent Relationship Management: The objective of the talent relationship is nurturing long-term association with candidates and the organizations. The personalised communication through talent communities, creating a touch points for talent engagement and providing useful information for future opportunities advance the scope and objective of talent relationship management.

Automating Hiring Process: The process starting from talent sourcing to on boarding, screening and interview planning, the entire optimization of recruitment stages is channelized through automating the hiring process. The process brings efficiency in the system, creating opportunities for HR to focus on other strategic aspects of Recruitment.

Job Listing: Job listing is vital for the hiring process. The detailed information related to employment opportunities helps both potential job seekers and job hunters. The information on role requirement, organization culture and values

conveys the role expectation from the organization. The communication through job advertisement and job listing is vital for attracting quality hire.

Interview Scheduling: The automation process require interview scheduling to be systematic. Coordinating with dates, time and schedules for interviews play significant roles in the hiring process. The automation process thus enhances the agility towards interview scheduling and alleviates the administrative burden on human resource professionals

Predictive Analytics: The data driven predictive analytics has a lot to offer in the area of human resources. The end-to-end AI driven recruitment process can utilize the benefits of predictive analytics. The decision-making based upon the talent acquisition, workforce planning, employee retention can leverage by way of predictive analytics. The responsible use of data, privacy concerns are some of the glaring ethical and governance related concerns that organizations should always be careful.

Recruitment Marketing: Recruitment marketing integrates marketing and human resources strategies to attract, engage, and convert potential candidates into applicants. It plays a crucial role in expanding candidate diversity and bolstering an organization's competitive advantage in talent acquisition. In the dynamic job market, effective recruitment marketing is essential for optimizing efforts and connecting with the most suitable candidates.

Pipeline Management: It involves the continuous sourcing, engagement, and nurturing of relationships with a diverse range of candidates, often organized into various talent pipelines according to specific job roles, skills, or other relevant criteria. Pipeline management is crucial in ensuring that organizations have a robust and sustainable talent pool readily available to meet their evolving staffing needs and strategic objectives.

Performance Management: Performance management is a comprehensive process that encompasses various activities, systems, and strategies within an

organization, primarily aimed at enhancing employee productivity, development, and overall effectiveness. Typical performance management software can provide the assistance in various methods like performance appraisal methods, feedback mechanisms, and the role of performance management in talent development, employee engagement, and decision-making.

Employee Onboarding: Employee onboarding is the systematic process through which new employees are introduced to an organization, its culture, policies, and their specific roles. Effective onboarding not only ensures a smooth transition for new hires but also plays a pivotal role in shaping their engagement, productivity, and retention.

Skill Assessment: Skill assessment is encompassing the evaluation and measurement of an individual's competencies, knowledge, and abilities. It can be defined as a systematic process that involves identifying, quantifying, and validating the skills and qualifications of individuals, often for purposes like recruitment, training, or performance appraisal. Skill assessment is crucial for organizations seeking to make informed decisions about talent acquisition, development, and optimization, and it contributes to more effective human resource management strategies in a competitive and evolving job market.

Chat-Bot: Artificial intelligence-driven chat-bots within human resources software are used to automate and enhance various aspects of the recruitment process. Chat-bots in HR software assist in tasks such as initial candidate screening, answering applicant queries, and scheduling interviews. The role of chat-bots in HR software for recruitment is vital for organizations aiming to leverage technology to streamline their talent acquisition processes while ensuring fairness and compliance with ethical standards in their hiring practices.

4.3 Feature Wise Tool Analyses
Table 1 provides the quick glance of all the tools taken in the study along with their official website link. The features listed in the above section are

compared with reference to these tools.

Table 1. Tools and their official website

Sr. no	Tool	Website
1.	Arya	https://leoforce.com/
2.	Beamery	https://beamery.com/
3.	Cogbee	https://www.cogbee.io/
4.	Eightfold.ai	https://eightfold.ai/
5.	Enboarder	https://enboarder.com/
6.	Fetcher	https://fetcher.ai/
7.	iMocha	https://www.imocha.io/
8.	Loxo	https://loxo.co/
9.	Olivia	https://www.paradox.ai/
10.	Recrooit	https://www.recrooit.com/
11.	Seekout	https://www.seekout.com/
12	Talmundo	https://www.talmundo.com/
13	Textio	https://textio.com/
14	Zavvy	https://www.zavvy.io/

Based on emerged features, a comparative analysis is presented in table no 2. Since, requirement for reach organization varies; employers can select the tool suiting their needs.

As shown in the table no 2, none of the tool provides all the features however **Arya** and **Beamery** provides maximum capabilities excluding chatbot, employee onboarding and performance management. **Zavvy** provide only talent relationship management whereas **Enbroder** and **Talmundo** help in employee onboarding process. **i-Mocha** only facilitates in skill assessment, which could be used for both existing and the aspiring candidates. If company's objective is limited to skill assessment, then it can be a right choice. **Textio** provides the job listing and chat bot support in hiring process. **Seekout** is suitable for candidate sourcing and matching hence a helpful tool in talent acquisition process. **Recrooit** is another useful tool designed to cater end to end automated hiring process, including the candidate sourcing and matching

facility. **Olivia**, **loxo**, **fetcher** and **eightfold.ai** are capable of candidate sourcing and matching along with the huge candidate dataset integrated with these systems. **Cogbee** is another option for talent acquisition tool along with additional capabilities like candidate engagement and performance management.

Table 2. Features Comparison

Tools(→) Features(↓)	Arya	Beamery	Cogbee	Eightfold.ai	Enboarder	Fetcher	iMocha	Loxo	Olivia	Recrooit	Seekout	Talmundo	Textio	Zavvy
Talent Acquisition	Y		Y	Y				Y	Y	Y	Y			
Automating Hiring Process	Y									Y				
Job Listing													Y	
Candidate Sourcing and Matching	Y			Y		Y		Y		Y	Y			
Interview Scheduling						Y								
Predictive Analytics	Y			Y										
Talent Relationship Management		Y												Y
Candidate Engagement		Y	Y					Y	Y			Y		
Recruitment Marketing		Y												
Pipeline Management		Y												
Performance Management			Y				Y							
Employee onboarding					Y							Y		
Skill Assessment							Y							
ChatBot										Y			Y	

The result shows that maximum number of tools is designed to provide the talent acquisition, candidate sourcing, matching and candidate engagement functionality. The tools facilitating the entire automated hiring process are limited. Though the hiring features related to interview scheduling and transcription of the interview are considered important, the finding reflect only one such tool available named Fetcher. Organization has to keep their vision in mind before adopting any tool available in HR recruitment domain.

5.   Challenges in AI Based Tool Development and Uses

Talent acquisition encompasses a sequence of tasks, including planning, sourcing, selecting, and onboarding. AI plays a prominent role in the recruitment process, offering efficiency and ease, particularly in the context of Industry 4.0. (Mehrotra and Khanna, 2022). Organizations are increasingly embracing AI to modernize their candidate search and selection methods. AI in recruitment leverages technology, effectively utilizing computers to automate and streamline various recruitment functions. These systems are designed to mimic human intelligence and behavior, making them an integral part of the evolving recruitment landscape. Nevertheless, the primary hurdle faced by AI is its substantial data requirement to grasp human psychology and behavior. Furthermore, because AI identifies and emulates patterns in human decision-making and behavior, it introduces the potential for biases. According to Mehrotra and Khanna (2022), ensuring the authenticity of both the data used to train AI systems and the candidates applying for jobs is another critical concern. Building a scalable infrastructure for AI can be expensive, particularly when hiring senior positions using this technology. AI recruitment tools are better suited for large organizations with high-volume hiring needs. Security issues, such as the misuse of technology and potential hacking, also pose potential risks, as do flawed system designs. Many individuals struggle to establish a compelling business case for AI applications, hindering their ability to grasp the fundamental value of this technology, thus presenting a significant barrier to its adoption. Consequently, companies need to thoughtfully consider, as how to incorporate AI and automation to maximize their advantages and ensure a harmonious collaboration between humans and machines.

6. Conclusion

The influence of technological progress, notably in artificial intelligence (AI), on the labor market and human resource management (HRM) has been substantial and diverse. While AI holds the potential to revolutionize HR practices, its impact is a subject of debate. On one side, AI in HRM can boost efficiency, productivity, and introduce new job roles, streamlining processes like recruitment, performance evaluation, employee engagement, and talent management. Already transforming recruitment processes, AI-based HR tools analyze extensive datasets, extract data from social networks, and facilitate onboarding through chatbots. AI is also pivotal in performance management, employee well-being, and ensuring compliance with labor laws. The selection of the right AI-based HR recruitment tool is a crucial decision, requiring consideration of specific recruitment goals, hiring volume, necessary skill sets, data sources, integration needs, data privacy, long-term requirements, and budget. AI tools offer various features, from candidate sourcing and matching to pipeline management and predictive analytics. Arya and Beamery lead in capabilities, followed by Zavvy, Enbroder, and Talmundo. Despite potential benefits, challenges like data requirements, biases, data authenticity, scalability, security issues, and the need for a compelling business case exist. To fully leverage AI in HRM, organizations must thoughtfully integrate it while maintaining a harmonious balance between human and machine contributions.

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About the Authors:

Manjari Srivastava is Professor in the area of HR and Behavioral Sciences in the School of Business Management, Navi Mumbai Campus, SVKM's Narsee Monjee Institute of Management Studies (NMIMS), Mumbai. Her research interests lie in the domains of leadership, managerial and team effectiveness, positive psychology, emotional intelligence, employee voice and customer experience. Dr. Manjari Srivastava can be contacted at: Manjari.Srivastava@sbm.nmims.edu

Monika Sharma is an Assistant Professor at School of Technology Management NMIMS Navi Mumbai Campus. She holds a Ph.D. degree in Computer Engineering with a specialization in Machine Learning and Data Analytics. She is a certified agile scrum master and practitioner. Her contributions to the software product quality improvement earned her the Ring of Quality award. She has vast experience in almost every stage of the SDLC, making her a well-rounded professional who can handle complex projects from start to finish.

RESHAPING TALENT MANAGEMENT STRATEGIES: ROLE OF AI

Deepak Sharma*

Associate Professor Human Resources, School of Business Management,
SVKM's Narsee Monjee Institute of Management Studies
(NMIMS) Deemed To Be University, Bengaluru, Karnataka
E-mail: deepak.sharma@nmims.edu

Yash Sinha

MBA-HR (Final Year), School of Business Management
SVKM's Narsee Monjee Institute of Management Studies
(NMIMS) Deemed To Be University, Bengaluru, Karnataka

Mahima Guwalani

MBA-HR (Final Year), School of Business Management
SVKM's Narsee Monjee Institute of Management Studies
(NMIMS) Deemed To Be University, Bengaluru, Karnataka

Abstract:

In the dynamic landscape of the modern corporate world, talent management has emerged as a pivotal cornerstone for organizational success. Traditionally, talent management encompassed a spectrum of processes, from recruitment and onboarding to talent mobility, retention, and succession planning. However, with the advent of Artificial Intelligence (AI), there has been a transformative shift in how these processes are approached and executed. AI, with its predictive analytics and data-driven insights, offers unprecedented capabilities in identifying potential talent, gauging employee engagement, and predicting turnover tendencies. Furthermore, it

aids in fostering talent mobility by mapping skills to roles and identifying gaps that require upskilling or reskilling. Retention strategies, once based on generic engagement initiatives, are now tailored with personalized recommendations derived from AI algorithms. Succession planning, too, has seen a revolution, with AI providing a clearer view of internal talent pools and their readiness for leadership roles. As organizations globally embrace this technological marvel, AI is not just an enabler but a game-changer, reshaping the very contours of talent management. This chapter, with the help of a proposed model, explores role of AI in developing & reshaping HR systems, practices, & processes. As its popularly said, "artificial intelligence will change the work HR does, but it won't change the need for the 'human' in human resources.

Keywords: Predictive Analytics, Data-Driven Insights, Digital Transformation, Talent Management, Future Ready HR, Employee Engagement

1. Introduction: The Evolving HR Landscape and AI's Fundamentals

The realm of Human Resources (HR) stands on the cusp of a revolution, with artificial intelligence (AI) serving as the catalyst. Gone are the days when HR was solely about personnel management; today, it's about steering human potential and driving organizational growth. AI, known for its prowess in mimicking human cognition, is progressively intertwining with HR, leading to an evolution that's redefining the workplace. The transformative impact of AI on HR practices is profound, reshaping everything from recruitment to employee engagement. AI's integration into HR isn't a mere enhancement; it's a fundamental shift in how businesses understand their most valuable asset: their people. This technology, with its ability to analyze extensive datasets quickly, brings a new dimension of insight to HR professionals. It allows for predictive analysis on employee performance, understanding nuances that contribute to job satisfaction, and personalizing the employee experience, factors that were once intangible and often overlooked.

One significant area where AI is making strides is recruitment. Traditional hiring processes, often lengthy and subjective, are undergoing a metamorphosis. AI's ability to catalog behavioural patterns and assess job fit based on an individual's disposition is invaluable. It's not just about filling a

position but finding the right synergy between the role and the candidate. Virtual interviews, facilitated by AI, are breaking geographical barriers, making talent acquisition a global game. However, this innovation isn't without its challenges. The self-evolving nature of AI calls for stringent oversight to prevent governance issues and ensure ethical deployment (Menaka, 2023).

Beyond hiring, AI's influence extends to nurturing talent within the organization. Learning and development programs are now more than generic training sessions. AI's analytical capabilities enable the creation of tailored programs that consider an individual's current skill set, career aspirations, and learning style. This personalized approach ensures employees are more engaged in their growth plans, leading to a more fulfilled and productive workforce. As we contemplate the future, it becomes apparent that the role of the human resources professional is undergoing a transformation in parallel with the technological advancements. In the future, human resource (HR) leaders will be required to possess a strong proficiency in technology, specifically with respect to capabilities of AI (Sooraksa, 2021).

HR Professionals will be required to possess strong skills in change management in order to effectively lead their organisations through this unfamiliar and unpredictable terrain. Significantly, it is imperative for organisations to maintain the human element in their human resources function, effectively harmonising technological efficacy with empathy and ethical accountability. In summary, the chapter aims at exploring the dimensions within which the integration of AI in the field of HR & talent management is taking place to unleash the complete capabilities of each employee, dyad, team and finally leading to building of organizational capabilities.

2. Review of the Literature

Human Resource Management (HRM) may be witnessed as going through significant transformation which is triggered by changes in technological domain (Bondarouk et al., 2017). The paper reviews research work of four

decades in this area with the objective of providing a thoughtful and integrative perspective as a pre-work for future research.The factors impacting the adoption of e-HRM can be categorised into: technology; organization; and people – referred as the 'TOP' framework.

Matsa and Gullamajji (2019) emphasize that for organizations to remain in run with their competitors, they need to go for innovation and adaptability in their HR practices, which pull HR away from administrative issues and challenges to areas that help rework on and improve employee experience, by focus on artificial intelligence (AI) technologies.

Zehir et al. (2020) have worked on impact the technological maturation of the HR systems/processes has on company's effectiveness.

Upadhyay and Khandelwal (2018), have conducted research in the recruitment function regarding the extent of adoption of AI.

Gulliford and Dixon (2019) with the help of a case study, traced the transformation of AI, from preliminary to present day, based on the experience of an organization.

Pillai and Sivathanu's (2020) study related to AI adoption in HR in the recruitment domain in HR in technology/ technology-enabled service sectors in Pune and Mumbai cities in India.

Niehueser and Boak (2020) conducted a study in a recruitment organization, to study the impact on the adoption of AI, due to the attitudes of employees on initiation of implementation of AI in the HR processes.

Since last four decades organizations have worked on adopting e-HRM practices including technology in order to gain achieving strategic advantages (Kovach, Hughes, Fagan, & Maggitti, 2002; Marler & Parry, 2015; Strohmeier, 2009).

E-HRM aims at providing cost effectiveness, benefits related to service and re-orientation of HR experts to become more focused strategically (Ruël, Bondarouk, & Van der Velde, 2007).

AI is currently being employed in multiple phases of the employee lifecycle, encompassing recruitment, onboarding, performance evaluation, and talent enhancement. These capabilities provide human resources professionals with improved insights into employee behaviour, skills, and potential (Prasanna Tambe, P. Cappelli, V. Yakubovich, 2019).

Gurusinghe and Arachchige (2021) provide significant contributions to the understanding of how AI can be effectively incorporated into talent management frameworks, with the objective of enhancing employee engagement and overall organisational performance.

AI-powered systems have the capability to analyse extensive quantities of data derived from resumes, social media platforms, and even facial expressions observed during interviews. This enables the acquisition of insights that were previously unattainable or not feasible to gather. The degree of thorough analysis guarantees that the recruitment process is not only expedited, but also considerably more dependable and equitable (Pillai, Rajasshrie & Sivathanu & Brijesh, 2020).

3. Reinventing HR Foundations with Workforce Dynamics

The HR domain, which was previously confined to administrative tasks, is presently undergoing a substantial metamorphosis as a result of the incorporation of AI. This involves more than simply replacing manual tasks with technology. It involves a deep reassessment and restructuring of the fundamental functions within the domain of HR. The incorporation of AI within the realm of HR is transforming our comprehension of workforce dynamics, presenting an unprecedented level of intricacy and insight that was previously inconceivable. The incorporation of AI within the domain of HR has facilitated the adoption of a data-driven methodology for the management of personnel.

The recruitment process is significantly impacted by artificial intelligence, leading to discernible consequences. Traditional methods, often criticised for their subjective nature and inefficiency, are being substituted by AI techniques that provide increased speed, enhanced accuracy, and diminished bias. Artificial intelligence algorithms possess the capacity to effectively analyse large pools of applicants, employing pre-established criteria to identify potential candidates. Moreover, these algorithms have the capability to utilise sophisticated sentiment analysis techniques in order to assess cultural compatibility. This methodology for talent acquisition ensures a holistic viewpoint that considers a multitude of factors beyond mere credentials and professional background.

Nevertheless, the influence of artificial intelligence extends beyond the domain of talent acquisition. This concerns the way in which organisations manage, develop, and retain their human resources. AI-driven systems have the capability to monitor and assess the performance effectiveness of employees in real-time, providing valuable feedback and identifying areas where additional training may be required. Vrontis and Christofi (2021) through the examination of data pertaining to employees' skills, career aspirations, and performance found that AI has the potential to assist human resource professionals in devising individualised development strategies. This utilisation of AI can effectively enhance employee engagement and retention within organisations. This approach not only facilitates the development of talent within the organisation but also cultivates a culture characterised by ongoing learning and enhancement.

The process of integrating AI is accompanied by numerous obstacles. Issues surrounding data privacy, security, and ethical considerations have become prominent in recent times. Additionally, there exists apprehension regarding the potential displacement of jobs as a result of automation. This concern necessitates that organisations take proactive measures to address the issue by providing retraining and upskilling opportunities for their employees.

Furthermore, the presence of inherent biases in AI algorithms poses a substantial concern, thereby requiring rigorous measures to guarantee equity and openness. The future of HR is intricately intertwined with AI. However, the evolving landscape necessitates HR professionals to acquire a novel set of skills. In addition to possessing technological proficiency, individuals are required to demonstrate proficiency in change management, data interpretation, and strategic decision-making.

In order to effectively navigate the digital transformation, individuals must possess the necessary skills and knowledge to assume leadership roles within the workforce. This entails not only addressing potential concerns that may arise during this process, but also actively advocating for the integration and utilisation of emerging technologies. AI serves a dual purpose, functioning not only as a means to enhance efficiency but also as a catalyst for transformative change. The integration of AI within the field of HR entails enhancing the abilities of organisational personnel by employing optimisation methods. The objective is to foster a labour force that exhibits resilience, adaptability, and preparedness in order to effectively confront the forthcoming challenges. Human resources professionals assume a pivotal role in facilitating advancements within this nascent field, thereby encapsulating the fundamental nature of this transformative shift.

4. Innovations in Talent Acquisition

The current state of talent acquisition is undergoing a significant shift, characterised by the emergence of AI as a prominent force driving it towards uncharted territories. The current decade has observed a significant transformation in recruitment procedures, where AI has evolved from being a supplementary tool to becoming a pivotal catalyst for change. The conventional approaches, which are frequently hindered by subjectivity and inefficiencies, are being swiftly substituted by the precision, speed, and objectivity of AI.

The integration of AI into the field of recruitment has been undeniably transformative. The objective extends beyond expediting the process of

reviewing resumes; rather, it encompasses a comprehensive assessment of candidates, encompassing not only their proficiencies and credentials, but also their potential and alignment with the organisational culture.

One of the most significant advancements pertains to the utilisation of AI in the establishment and administration of talent pools. In the current labour market characterised by heightened competition, the task of identifying an ideal candidate can be likened to locating a needle within a haystack. AI is utilised in the process of identifying potential candidates, including both active and passive individuals, and subsequently engaging with them through personalised interactions. The implementation of this proactive approach guarantees that in the event of a vacant position, there exists a pre-established group of eligible candidates who are readily available for evaluation and consideration. Nevertheless, the incorporation of AI in the process of talent acquisition is not devoid of obstacles. One notable issue of concern pertains to the potential presence of bias within AI algorithms, which has the potential to perpetuate preexisting prejudices within the hiring process. The matter of data privacy and the ethical utilisation of AI also poses significant considerations that organisations must approach with caution. Algorithms are incapable of fully substituting the human element in the field of HR, and achieving an optimal equilibrium is crucial.

Bersin (2003) highlighted the extensive manual tasks involved in talent management process, especially in Talent Acquisition. These include job description drafting, query formulation for candidate sourcing, email correspondence, interview scheduling, analysis of candidate interactions, offer letter composition and even salary negotiation. Often, these tasks cause bottlenecks due to the involvement of various stakeholders and the substantial time they consume.

In response to these challenges, LinkedIn Recruiter introduced an array of "automated tools" categorized into four distinct areas. These tools leverage the power of Generative AI to revolutionize talent management. They encompass AI-assisted candidate discovery, simplifying sourcing, filtering, selection, and

skills analysis. These lead to smarter suggestions that broaden search results by proposing locations, job titles, skills, and more; streamlined candidate outreach through AI-assisted InMails and automated follow-up messages; and actionable data and insights, offering comprehensive reports for analyzing job advertisements. This innovative application of AI not only accelerates the recruiting process but also leverages data from company databases to drive automation. Moreover, it simplifies the search process, enabling users to search in natural language, reducing the need for recruiters to master complex search logic.

As a result, generative AI is poised to reshape talent management process with LinkedIn leading the charge in demonstrating how Gen AI can enhance productivity, streamline operations and empower both employees and recruiters to achieve exceptional performance in their roles.

The role of human resource professionals is undergoing transformation in the context of an AI-driven environment. Proficiency in effectively utilising these technologies, accurately interpreting the data produced, and making well-informed decisions is imperative. It is of utmost importance to ensure responsible utilisation of these tools, while also considering the ethical implications and the fundamental human element that lies at the heart of human resources. AI is fundamentally reshaping the fundamental aspects of talent acquisition. The objective extends beyond mere optimisation of the process; it encompasses the augmentation of the calibre of recruits, enhancement of the candidate's experience, and ultimately, the facilitation of the organization's triumph. The future of talent acquisition will be significantly influenced by the continuous innovation and responsible utilisation of artificial intelligence.

5. Advancements in Learning and Development

Within the current corporate environment, the notion of learning and development (L&D) has surpassed conventional limitations, transforming into a strategic foundation that supports both organisational adaptability and the advancement of employees. The integration of AI has played a significant role

in catalysing this evolution, as it has emerged as a disruptive force that is ushering in a new era of personalised, efficient, and impactful learning experiences. The emergence of AI within the realm of learning and development (L&D) is fundamentally reshaping the underlying principles and values of corporate training initiatives. Traditional one-size-fits-all models are being supplanted by highly customized learning pathways, which consider individual career aspirations, skillsets, and learning paces. AI's sophisticated algorithms analyze employees' performance data, previous learning patterns, and career trajectories to curate or recommend learning modules tailored to each individual's needs. This personalization aspect not only enhances the learning experience but also boosts engagement and retention rates (Xi Ganga, 2021).

Moreover, the scope of AI in L&D transcends personalization. It's revolutionizing the delivery of training programs. Micro-learning and byte-sized modules, easily accessible via various platforms, are becoming the norm. These succinct, focused snippets of knowledge are particularly effective in catering to the dwindling attention spans of the modern workforce and the fast-paced work environments they operate in. They allow employees to learn on-the-go, applying their acquired knowledge almost immediately to real-world scenarios.

AI's role in competency development and skill gap analysis is another breakthrough. By continuously assessing employees' performances, AI systems can identify skill gaps, proposing subsequent training to bridge these gaps efficiently. This proactive approach to skill development is crucial in today's rapidly evolving job market, where technological advancements can render skills obsolete almost overnight.

Interactive learning, a significant advancement in the field of learning and development, is increasingly being adopted, with the assistance of AI. The integration of AI-enabled chatbots and virtual assistants within educational training programmes is augmenting learner engagement by facilitating interactive sessions. These digital entities have the capability to offer

immediate feedback, address uncertainties, and even replicate real-world situations, enabling employees to engage in experiential learning, a method that has been demonstrated to be notably more impactful than passive learning. Nevertheless, the incorporation of AI into the field of learning and development (L&D) is not without its difficulties.

Organizations are required to address concerns pertaining to data privacy, the ethical utilization of AI, and the digital divide among employees. The success of AI-driven L&D initiatives hinges on the paramount importance of ensuring inclusivity and accessibility for all employees. The integration of AI in the field of learning and development (L&D) has brought about significant changes, presenting prospects for tailored, uninterrupted, and captivating learning encounters. The implementation of this approach enables employees to assume responsibility for their personal and professional development, thereby cultivating an environment that promotes continuous learning throughout their careers. As technological progress continues, the integration of AI and learning and development (L&D) will increasingly strengthen, establishing novel standards in the enhancement of employee skills and the expansion of organizations.

6. AI-Driven Talent Management Strategy

In the contemporary business ecosystem, talent management has emerged as a strategic linchpin, pivotal in steering organizational success and competitive advantage. The infusion of AI into this realm has heralded an era of unprecedented transformation, recalibrating the traditional paradigms that have long governed the ways we attract, retain, and nurture talent.

AI's intersection with talent management is multifaceted, permeating every conceivable aspect of the employee lifecycle. One of the most salient applications is in predictive analytics, a domain where AI's prowess is unequivocally pronounced. By harnessing the power of data, organizations can now anticipate future talent needs, identify potential leadership gaps, and even predict turnover, enabling proactive strategizing that is both efficient and effective.

Furthermore, AI's role in talent development and retention cannot be overstated. Customized learning programs, career pathing, and real-time feedback are now realities, thanks to AI's analytical and adaptive capabilities. The adoption of individualised strategies not only yields favourable outcomes in terms of employee contentment and tenure, but also assumes a crucial function in fostering a culture of continuous learning and innovation within the institution. The journey may not be not devoid of challenges. The ethical quandaries posed by AI, particularly concerning data privacy and algorithmic biases, are significant. Organizations must navigate these complexities with a balanced approach, ensuring transparency, fairness, and adherence to regulatory standards.

Grillo and Hackett (2015) highlight the potential of AI in boosting employee retention while also emphasizing the need for ethical considerations and risk mitigation. Moreover, the human element remains irreplaceable. AI serves as a tool, an enabler that augments human decision-making. The role of HR professionals is evolving; they need to be adept at interpreting AI-generated insights and leveraging them strategically. They must also be the custodians of the ethical use of AI, ensuring that technology complements human intelligence and empathy, rather than replacing it.

7. Overcoming the Hurdles of AI Integration

The integration of AI into various sectors marks a revolutionary stride in modernization, yet it's not without its share of obstacles. These challenges, spanning technical intricacies, ethical dilemmas, and societal implications, are multifaceted and demand a comprehensive, nuanced approach for successful AI assimilation.

One primary hurdle lies in data management. AI systems require substantial amounts of data to learn and make informed decisions. However, issues related to data privacy, security, and quality significantly impede AI's effectiveness. Organizations must establish robust data governance protocols to ensure data integrity and confidentiality. Moreover, the black-box nature of

AI algorithms raises concerns about their transparency and accountability. Explainable AI (XAI) is emerging as a solution, aiming to make AI's decision-making process more transparent and understandable to humans (Guidotti and Monreale, 2018). This transparency is crucial for gaining trust and facilitating regulatory compliance, especially in sectors like healthcare and finance where decisions have significant consequences.

Another significant impediment is the potential bias within AI systems, which can lead to unfair and discriminatory outcomes. It's imperative to develop AI with an ethical framework in mind, incorporating diverse datasets and implementing algorithmic audits to detect and mitigate biases. Landers and Behrend (2022), emphasize the need for a standardized approach to counteract these inherent biases, ensuring AI's ethical and fair application.

The technical integration of AI into existing systems presents its own set of challenges. Legacy systems, lack of interoperability, and technical debt can hinder the seamless integration of AI technologies. Adopting a modular approach, prioritizing scalability, and ensuring regular software updates are strategies that can ease this transition. Furthermore, the human-AI interaction must be carefully managed to ensure user acceptance and trust in AI systems. Addressing skepticism requires demonstrating AI's reliability and establishing clear guidelines for its use.

Furthermore, the skill gap in AI literacy is a considerable barrier. There's a pressing need for comprehensive education and training programs to upskill the workforce and foster an AI-ready culture. Initiatives should not be limited to technical skills but should also include ethical considerations of AI use.The successful integration of AI poses a complex challenge that necessitates a collaborative endeavour spanning multiple domains. The process encompasses the assurance of data privacy and security, the augmentation of transparency and accountability, the mitigation of biases, the management of technical integration, and the bridging of the skill gap. As society progresses into the era of AI augmentation, it becomes imperative to adopt a proactive, well-informed, and ethically conscious stance in order to effectively and responsibly leverage the complete capabilities of AI.

8.   Future-Ready HR: Skills for an AI-Augmented World

The dawn of AI in the workplace heralds a transformative era, necessitating a recalibration of skills within HR to navigate this tech-augmented landscape. As AI becomes increasingly intertwined with business operations, HR professionals must equip themselves with a unique blend of skills to stay relevant and effective. Bukartaite and Hooper (2023) emphasize the continuous need for both soft and hard skills in a technologized workplace. Emotional intelligence tops the list, as HR's role pivots from administrative to strategic, focusing more on people management and less on transactional tasks automated by AI. The ability to empathize, engage, and communicate effectively with employees will be paramount, especially as remote work and digital interactions become commonplace. Critical thinking and data literacy are other crucial competencies. With AI providing a wealth of data-driven insights, HR professionals must interpret and make strategic decisions based on this information. They need to question AI-generated recommendations, consider ethical implications, and make decisions that align with organizational values and goals.

HR professionals must adopt a lifelong learning mindset, staying abreast of AI trends, understanding its capabilities, and knowing how to leverage AI tools for talent acquisition, employee engagement, performance management, and more.

Pandya (2019) emphasizes the growing demand for workers with complementary skills due to the adoption of AI and Machine Learning (ML) technologies. HR professionals themselves need to be tech-savvy, not in terms of coding, but in understanding and utilizing AI-driven HR tools and platforms. They must be comfortable navigating AI interfaces, using analytics dashboards, and implementing tech-driven HR solutions. The future-ready HR professional is a blend of strategist, coach, technologist, and data analyst. They are empathetic leaders, continuous learners, and change agents who can harness the power of AI to enhance the human aspect of the workplace. As we step into an AI-augmented world, these multifaceted skill sets will be the cornerstone of an effective, future-ready HR professional. Employee lifecycle

model that incorporates AI into talent management can significantly improve the effectiveness of HR processes.

9. AI and Corporate Examples

Attempt has been made to explore how leading organisations are leveraging AI to enhance their talent management practices and the innovative approaches adopted by such corporate houses. In the examples below, there is an evidence of how organisations such as Intuit and Unilever, streamline recruitment, improve candidate assessment, drive diversity, and increase efficiency in their HR operations.

Intuit

Intuit, a multinational financial software company, has set an ambitious hiring goal of over 6,000 employees annually. To achieve this, they have implemented AI technology to streamline their recruitment process. By leveraging AI algorithms, Intuit can efficiently narrow down the talent pool and identify candidates who are most likely to be interested in joining the company. Additionally, the algorithm-driven platform matches potential hires with open positions based on how closely their profiles resemble those of their top performers. This innovative approach helps them uncover candidate leads that may have been overlooked using traditional methods.

Unilever

Unilever, has implemented artificial intelligence to revamp their screening process for entry-level employees. In 2017, the company introduced AI-powered assessments that involve candidates engaging in neuroscience-based games to evaluate their traits. Furthermore, recorded interviews are analysed by AI systems to assess suitability for different roles within the organization. Unilever views this initiative as a resounding success and has integrated it permanently into their hiring process. Notably, they have observed a significant increase in diversity among newly hired individuals and have achieved greater cost efficiency by leveraging AI-driven talent acquisition methods.

10. Proposed model from an Employer & Employee perspective

The employer to employee(E2E) talent synergy model (fig.1) integrates AI with the organization at different stages of the employee journey. This includes AI-enabled recruitment and onboarding processes, real-time career management, skills development recommendations, employee wellness support, career development optimization and off boarding. This model increases efficiency, personalization, and data-driven decision-making, offering a comprehensive and effective approach to talent management. However, a right kind of balancing between human interaction and AI is to be maintained for this model to function in a healthy and inclusive workplace.
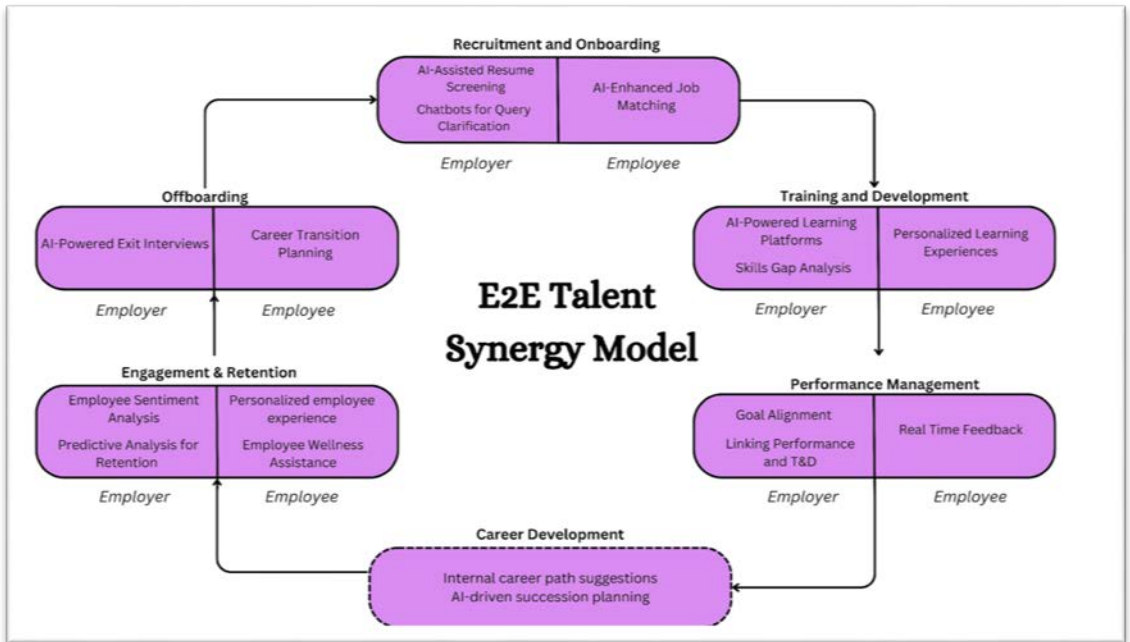

Fig.1 The Employer to employee(E2E) talent synergy model (author's representation)

By integrating AI into every stage of the employee lifecycle, organizations can streamline talent management, enhance the employee experience, and make data-driven decisions to improve employee satisfaction and organizational performance. However, it is important to have human oversight to ensure ethical use of AI in talent management.

11. Conclusion

The role of artificial intelligence in human resources is expanding, and organizations worldwide are utilizing its potential to transform their HR processes. From the recruitment process to learning and development to performance management the AI techniques are providing increased speed, enhanced accuracy, and effectiveness to the systems and processes. Similarly, functions such as career development and employee retention (including employee engagement) are getting more streamlined by use of AI. The conventional approaches to HR, which were frequently infected by subjectivity in decision making and inefficiencies, are being swiftly substituted by the precision, speed, and objectivity of AI, which is being brought about in every aspect of talent management.

In conclusion, an AI-driven talent management strategy is not a distant future, it has rather touched us. It's about creating synergies between technology and human insight to unlock the full potential of every individual, thereby driving organizational growth. As we tread this path, continuous learning, adaptability, and ethical considerations will be the guiding beacons in this transformative journey.

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About the Authors

Deepak Sharma has been working as Associate Professor in the area of Human Resources at Narsee Monjee Institute of Management Studies, Bengaluru Campus and has 24 years of experience (with industry & academia combined). He has been Corporate Trainer/HR & Legal Consultant for industry houses as well as Faculty member of leading B-Schools of India namely, International Management Institute popularly known as IMI and Lal Bahadur Shastri Institute of Management, New Delhi. He has authored books, research papers/case studies and multiple articles in *Economic Times* HR World in the area of Human Resources. He imparts Management Development Programmes on Leadership development, Change Management, Team Building and Personal Effectiveness, Negotiation Skills, Industrial Relations, Labour Laws for HR Managers to name a few. His areas of interest include HR systems (namely, Learning & Development, Performance Management & Coaching, Cultural system, Renewal system & Organization Development), Labour Laws, ROI, Leadership Development, Employee experience, Employee engagement, Talent Management, Gender Sensitisation & Sexual Harassment at workplace. He can be contacted at deepak.sharma@nmims.edu.

Yash Sinha is a final year student specializing in the area of Human Resources at Narsee Monjee Institute of Management Studies, Bengaluru Campus. He has a computer science background, enriched by AI and ML project work with IORA Ecological Trust. Diving into an MBA in HR, he has cultivated a passion for nurturing talent through Learning and Development, carving out growth paths within organizations, and fine-tuning performance management. Real-world HR challenges attracted him to talent acquisition, innovative HR practices, HR Tech where he likes to work on designing HR strategies using the power of technology to build workplaces that buzz with potential and progress.

Mahima Guwalani is a final year student specializing in the area of Human Resources at Narsee Monjee Institute of Management Studies, Bengaluru

Campus. She comes from a technical background and having a heart for people she is deeply passionate about HR and Analytics, gaining valuable insights into the art of optimising human potential through data-driven decision-making and strives to create exceptional work environments where people can thrive.

NAVIGATING THE FUTURE OF WORK: CHALLENGES AND STRATEGIES

Sonali Narbariya

HRBS, School of Business Management

SVKM's Narsee Monjee Institute of Management Studies

(NMIMS), Mumbai, Deemed-to-be-University, India.

E-mail: sonali.narbariya@nmims.edu

Abstract: The concept of the "Future of Work" is dynamic and ever-changing, transforming our perceptions of employment and the workforce. This section provides a brief exploration of the primary challenges and strategies associated with the evolving nature of work. As technology continues to reshape industries, the discussion emphasizes the potential for job displacement and the urgent need for upskilling and reskilling. It also explores the evolving landscape of workplaces, highlighting the increasing prevalence of remote work and the necessity for organizations to embrace flexible structures. Additionally, the section underscores the significance of cultivating a culture of continuous learning and adaptability among individuals. It delves into the implications of these changes for work-life balance and stresses the role of well-being in the future of work. Concluding with an overview of relevant challenges and strategies, the section encourages proactive engagement with this transformative concept.

Keywords: Future of Work, Technological Advancement, Job Displacement, Remote Work.

1. Introduction

The realm of employment is experiencing a significant transformation. Technological progress, globalization, and evolving societal norms are altering our perspective on work. The conventional 9-to-5 office setup is no longer the

exclusive or predominant choice. Instead, we observe the rise of a varied, dynamic, and sometimes unpredictable environment. Addressing this forthcoming evolution in the work landscape entails confronting various challenges and recognizing opportunities, as explored in this essay. We will examine the obstacles, tactics, and wrap up with a contemplation of what the future may entail for individuals, collectives, and the larger community.

2. Automation and Job Displacement

The challenges confronting the future of work, specifically automation and job displacement, are intricately linked and present both opportunities and threats to the workforce, businesses, and society at large. Below is an overview of the challenges associated with automation and job displacement in the evolving landscape of work:

Technological Unemployment: Automation, driven by advances in artificial intelligence and robotics, has the potential to replace human workers across various sectors, leading to job reductions and potential unemployment or underemployment, especially for those in routine and repetitive roles.

Skills Mismatch: With increasing automation, there is a growing demand for specific skills such as programming, data analysis, and digital literacy. However, a number of people lack these critical skills. This resulted in larger skill deficiencies and lesser opportunities for people who were not well versed.

Structural Unemployment: Automation in the new age contributes to the unemployment, where some workers are displaced in finding new opportunities in several organizations in different industries. This can lead to long-term economic and social challenges for affected regions and communities.

Income Inequality: Automation tends to favor highly skilled workers, potentially worsening income inequality by displacing lower-skilled or

routine workers. The resulting income gap can contribute to social and economic disparities.

Job Polarization: Automation has the potential to polarize jobs, creating more high-skill, high-wage positions and low-skill, low-wage roles, while middle-skill jobs may decline. This situation poses challenges for individuals who previously held middle-skill positions.

Reskilling and Upskilling: To bridge the skills gap and assist workers in adapting to changing job requirements, robust reskilling and upskilling programs are necessary. Designing effective training initiatives, ensuring accessibility, and motivating worker participation are critical components of this challenge.

Transitioning Affected Industries: Entire industries may experience disruption due to automation. Effectively transitioning displaced workers from declining industries to those with growing demand is a complex and costly challenge.

Job Quality: While automation can eliminate routine tasks, it may also lead to a decline in job quality. Some workers may find themselves in precarious, part-time, or gig economy positions without job security or benefits.

Social and Psychological Impact: Job displacement can have a significant social and psychological impact on individuals and communities, resulting in stress, anxiety, and a sense of insecurity. Addressing the well-being of those affected is a crucial challenge.

Public Policy and Labor Market Adaptation: Policymakers need to adapt to these changes by implementing policies that support displaced workers, encourage innovation, and facilitate a smooth transition to a more automated workforce.

Ethical and Legal Concerns: The ethical use of automation and AI, especially in decision-making related to hiring, firing, and promotions, presents challenges in maintaining fairness and transparency.

Global Competition: As automation becomes more prevalent, countries with advanced technology infrastructure and skilled workforces may have a competitive advantage. This can result in shifting global economic dynamics and challenges for nations that lag behind.

3. Gig Economy and Job Insecurity

The gig economy and job insecurity are two significant challenges associated with the future of work. Here's an overview of each:

Gig Economy

The gig economy represents a workforce landscape defined by short-term, temporary, and frequently freelance or self-employed work arrangements. Its rapid expansion in recent times is primarily fuelled by technological platforms that facilitate the connection between workers and clients or customers. While the gig economy provides flexibility and potential opportunities for specific individuals, it also introduces several difficulties:

Income Insecurity: Gig workers often lack the stability of a regular income, as their earnings can vary greatly from month to month. This can make it difficult to budget and plan for the future.

Lack of Benefits: Generally, those involved in gig work do not receive the traditional perks associated with employment, such as health insurance, retirement schemes, paid time off, or job security. Consequently, they may face vulnerability during times of illness, injury, or economic downturns.

Legal Protections: Numerous gig workers are categorized as independent contractors, a classification that can curtail their entitlement to labor safeguards and benefits, including minimum wage, overtime compensation, and workplace safety standards.

Social Isolation: Gig workers often work remotely or independently, leading to social isolation and the absence of a sense of belonging to a workplace community.

Job Insecurity

Job insecurity is a broader concern associated with the changing nature of work. It refers to the fear or uncertainty that individuals may experience regarding the continuity of their employment. Several factors contribute to job insecurity in the future of work:

Automation and AI: The increasing use of automation and artificial intelligence can lead to the displacement of certain jobs, causing workers to worry about their future employability.

Globalization: Increased competition from global markets can lead to job outsourcing and offshoring, further affecting job security.

Rapid Technological Change: Many industries are experiencing rapid technological advancements, requiring workers to continuously adapt their skills and knowledge, which can lead to a sense of insecurity.

Non-Traditional Work Arrangements: As mentioned earlier, the gig economy and non-traditional work arrangements may result in job insecurity due to the lack of long-term employment contracts.

Addressing these challenges for the challenges of the future of work necessitates a comprehensive approach, encompassing:

Labor Protections: Policymakers should update labor laws, ensuring gig workers access essential benefits and protections, irrespective of their employment classification.

Skills Development: Promoting lifelong learning and reskilling initiatives empowers workers to adapt to evolving job requirements, enhancing their competitiveness in the job market.

Social Safety Nets: Broadening social safety nets to encompass gig workers and those in non-traditional employment arrangements offers a financial buffer during income instability.

Economic Diversification: Governments and businesses investing in economic diversification and job creation can reduce dependence on vulnerable sectors.

Collaboration: Employers, workers, unions, and governments collaborating can forge innovative models for job security and employment benefits in the evolving work landscape.

Addressing the challenges of the gig economy and job insecurity requires thoughtful consideration and proactive measures to ensure an equitable and secure future of work for all.

Remote Work and Burnout
Remote work has become a crucial aspect of the evolving work landscape, driven by technological advancements and shifting workforce dynamics. While it offers numerous advantages, it also introduces distinct challenges, notably the risk of burnout. Here are key considerations regarding remote work and its challenges in the context of the future of work:

Isolation and Loneliness: Remote work may lead to isolation, fostering feelings of loneliness and disconnection from colleagues, contributing to burnout due to the absence of traditional office social interactions.

Overworking: Establishing boundaries between work and personal life becomes challenging in remote settings, often resulting in overworking as employees struggle to disengage, heightening the risk of burnout.

Lack of Supervision: The absence of direct supervision may pressure remote workers to prove productivity, potentially leading to longer working hours detrimental to mental and physical well-being.

Communication Challenges: Effective communication is crucial in remote work, yet maintaining clear and timely communication poses challenges, causing stress and burnout due to misunderstandings or information delays.

Technology Overload: The constant use of digital tools can be overwhelming, contributing to burnout. The continuous influx of emails, messages, and virtual meetings can create a perpetual "on" feeling.

Lack of Work-Life Balance: Achieving work-life balance becomes challenging when home doubles as an office, potentially leading to stress and burnout as personal and family time is compromised.

Economic Disparities: Unequal access to a suitable home office can exacerbate remote work challenges. Economic disparities may hinder some individuals from having the necessary resources, leading to frustration and burnout.

Health and Well-being: While the elimination of daily commutes can be positive, it may also reduce physical activity, negatively impacting physical health and contributing to burnout.

Skills Mismatch:
Addressing the skills mismatch emerges as a notable challenge in the landscape of the future of work. This situation arises when the skills possessed by the workforce do not correspond to the skills demanded by employers and the evolving job market, resulting in various economic and social repercussions. Here are key considerations related to the skills mismatch challenge in the future of work:

Technological Advancements: The rapid evolution of technology acts as a catalyst for the skills mismatch. Emerging technologies often necessitate

specialized skills, leaving many workers without the requisite training to adapt. This mismatch can lead to a scarcity of skilled workers in high-demand fields and job displacement in traditional industries.

Automation and Artificial Intelligence: The automation of repetitive tasks and the integration of artificial intelligence fundamentally reshape the labor market. Jobs previously handled by humans now face automation, creating a heightened demand for individuals proficient in AI, machine learning, and data analysis. Those with outdated skills may find transitioning into these emerging roles challenging.

Aging Workforce: In numerous countries, the workforce is aging, and older workers may lack the digital skills needed for the technology-driven future of work. This can result in a skills gap as older workers contend with younger, more tech-savvy individuals.

Education and Training Gaps: Educational institutions and training programs may lag behind the swiftly changing job market, leading to graduates lacking the skills sought by employers. This mismatch between educational qualifications and job requirements poses a challenge.

Globalization: With businesses going global, there is an increased demand for workers with cross-cultural competencies and an understanding of international markets. Insufficient skills in these areas can result in a skills mismatch in the job market.

Soft Skills: Beyond technical skills, employers increasingly value soft skills like communication, creativity, problem-solving, and adaptability. The shortage of workers with these skills becomes a significant challenge for employers.

Geographic Mismatch: Job opportunities and the availability of skilled workers may not align geographically, leading to labor shortages in some regions and high unemployment in others.

Addressing the skills mismatch challenge, requires a comprehensive approach:

Continuous Learning: It is very important to encourage everyone to engage in ongoing learning and upskilling. Governments, employers, and educational institutions should support programs that facilitate the reskilling and upskilling of the workforce.

Collaboration: Effective collaboration among employers, policymakers, and educational institutions, is important to ensure that training and educational initiatives align with the evolving needs of the job market.

Flexibility: Companies should adopt flexible hiring which prioritize skills over traditional qualifications. They should be recruiting individuals with the potential to adapt and learn.

Career Guidance: Providing guidance and career counseling can empower individuals to make decisions about their education and training, enabling them to develop skills that are currently in demand.

Government Initiatives: Governments plays an important role in promoting workforce development. This involves implementing policies, offering incentives, and providing funding for businesses to invest in skill development and training.

Embrace Remote Work

Adopting remote work is a fundamental approach to navigating the changing landscape of work, particularly in response to the shifts prompted by the COVID-19 pandemic. While remote work offers numerous benefits such as flexibility and access to a global talent pool, it also brings unique challenges. Here are strategies for seamlessly integrating remote work into your future work methodology:

Establish a Dedicated Workspace: Create an organized workspace at home to separate work and personal life, promoting increased productivity.

Master Time Management: Develop robust time management skills using techniques like the Pomodoro method, task lists, or time blocking to enhance concentration and minimize interruptions.

Effective Communication: Given the reliance on digital tools, master communication platforms like Slack, Microsoft Teams, or Zoom for clear and concise interactions with colleagues.

Virtual Collaboration: Learn to collaborate effectively with remote teams, understanding project management tools like Asana or Trello, and participating in virtual meetings and brainstorming sessions.

Self-discipline: Cultivate self-discipline by setting boundaries, establishing a routine, and avoiding procrastination to maintain a strong work ethic.

Tech-Savviness: Stay updated on relevant digital tools and software, including cybersecurity best practices, to protect your work and data.

Goal Setting and Performance Metrics: Work with your employer to establish clear goals and performance metrics, regularly reviewing progress and making adjustments as needed.

Professional Development: Continue learning and growing in your field through online courses and resources, as remote work often requires more self-directed learning.

Wellness and Work-Life Balance: Prioritize mental and physical well-being, incorporating regular breaks and exercise into your routine. "Log off" at the end of your workday to maintain a healthy work-life balance.

Remote Networking: Maintain and expand your professional network remotely by attending virtual conferences, webinars, and industry-specific online events to connect with peers and mentors.

Collaboration and Networking

These are critical strategies in order to navigate the 'future of work'. It ensures that people and institutions remain at the competitive edge, adapt with the rapidly changing and evolving market off job opportunities. Effective strategies are as follows:

Regular Communication: Maintaining active communication with coworkers and workmates, even in a virtual mode and keeping everyone all in confidence regarding the development, limitations, and wins. These wins could be either proximal or distilled.

Cultivation of Cross Functional Skill: Nurture and enhance skills that showcases you someone as invaluable and indispensable member of the team in any cross-functional project work. This ability to excel across various departments can be a critical point in a any collaborative environment or system.

Social media leveraging: Use various social media platforms, in order to establish significant relationships with professionals in your area of expertise and even beyond the industry. Engage in required and relevant groups, share knowledge, and become a part of the conversations for expanding your horizons and keeping yourself appraised.

Coaching and Mentoring: Be active and seek mentors to coach you. These choses must be those who offer you with their expert opinion and guidance. They must support your professional endeavors and growth.

Diversity and Inclusion: Embrace and adapt to "diversity and inclusion" in your respective network. Remain in contact with people who can provide an array of expert opinions. These should be people from distinct industries, backgrounds, and perspectives. Diverse networks can provide fresh insights and opportunities for collaboration.

Develop a Brand: Build and develop a strong virtual presence and create a personal brand. Especially, LinkedIn must have a mention of your expertise. A well-articulated personal branding can help attract significant connections and opportunities can come your way.

Strategic Alliances: Identify potential partners or organizations with complementary skills or resources. Collaborate with them to pursue joint projects or ventures that can benefit both parties.

Give Before You Get: Networking operates as a mutual exchange. Provide assistance, share knowledge, or offer resources to others in your network without expecting immediate reciprocation. Establishing positive relationships within your network can pave the way for valuable connections and opportunities in the future.

Professional Associations: Become a member of professional associations relevant to your field. These organizations frequently host networking events, conferences, and provide resources to help you stay connected and informed about industry advancements.

Online Communities: Engage in online communities and forums pertinent to your interests and expertise. Active participation in discussions and sharing your insights can enhance your credibility and facilitate connections with professionals who share similar interests.

Feedback: Embrace and adapt to the feedback from peers. Apply constructive feedback as a mechanism to amplify the networking effect.

Continuous Learning: Be informed about the latest trends and technologies in your field.

Universal Basic Income
It is proposed as a solution for navigating the evolving landscape of work. It revolves around the government providing unconditional and regular

monitory payment to each citizen. This is regardless of their employment status. While UBI has both supporters and critics, it is considered a potential strategy for addressing challenges stemming from shifts in work dynamics and economic uncertainties. This is how UBI can be utilised as a strategic approach for the future of work:

Economic Security: UBI offers a safety net in a world where traditional job security is diminishing, ensuring individuals have a basic income to cover essential needs and reducing the risk of poverty.

Incentive for Learning and Up skilling: With guaranteed basic income, individuals may have the freedom to pursue education, training, and skills development, staying competitive in the job market.

Labor Market Flexibility: UBI can encourage the exploration of non-traditional work arrangements, fostering adaptability to the gig economy and allowing people to engage in multiple income sources.

Entrepreneurship and Innovation: UBI provides a financial cushion for aspiring entrepreneurs, fostering investment in innovative ventures and contributing to economic growth and job creation.

Reduced Bureaucracy: UBI simplifies social welfare systems, reducing administrative costs and the complexity of means-tested benefits, offering a straightforward approach to addressing poverty and inequality.

Gender Equality: UBI can address gender disparities by providing financial independence to women, potentially increasing opportunities for paid work or entrepreneurship.

Support for Low-Income Workers: UBI acts as supplementary income for low-wage workers, ensuring they can meet basic needs without solely relying on their employers.

Economic Stability: UBI serves as a counter-cyclical measure, injecting money into the economy during economic downturns, stimulating demand, and contributing to economic stability.

Poverty Reduction: A primary goal of UBI is poverty reduction, positively impacting overall societal well-being and public health.

Social Safety Net Transformation: UBI can coexist with or replace existing social safety net programs, streamlining the welfare system and potentially reducing administrative overhead.

Emphasis on Soft Skills:
Highlighting soft skills is a vital approach for navigating the evolving landscape of work. In an era shaped by the transformation brought about by automation and artificial intelligence, the significance of soft skills is on the rise. These interpersonal and human-centered skills are essential for adaptability, collaboration, and ensuring long-term career success. Here's how concentrating on soft skills can serve as a key strategy for the future of work:

Adaptability and Resilience: The capacity for adaptive and resilient soft skills empowers individuals to effectively handle change and uncertainty, which is crucial in a rapidly evolving job market.

Communication: Effective communication skills are indispensable for conveying ideas, collaborating with others, and building strong relationships. Clear and empathetic communication becomes increasingly valuable in a landscape where remote work and virtual communication are prevalent.

Emotional Intelligence: Emotional intelligence, encompassing self-awareness, empathy, and relationship management, helps individuals understand their own emotions and those of others. It plays a critical role in building strong working relationships and managing conflicts.

Collaboration and Teamwork: As the future of work involves cross-functional and remote teams, soft skills related to collaboration, such as teamwork, active listening, and conflict resolution, are essential for effective collaboration.

Problem Solving and Critical Thinking: Skills like problem-solving and critical thinking empower individuals to assess complex situations, make well-informed decisions, and devise innovative solutions, contributing value across various job roles.

Creativity and Innovation: With routine tasks being automated, human creativity and innovation are highly prized. Individuals who can think creatively, generate novel ideas, and drive innovation will be sought after.

Leadership and Influence: Leadership skills, even outside managerial roles, hold value. The ability to influence, inspire, and lead others, as well as take initiative, can pave the way for career advancement opportunities.

Cultural Competence: In an increasingly diverse and globalized workplace, understanding and respecting different cultures and perspectives are critical for effective collaboration and inclusivity.

Customer Service and Client Relations: Soft skills related to customer service and client relations are indispensable across industries. Building and maintaining relationships with clients are key drivers of success.

Networking and Relationship Building: The proficiency to network effectively and build strong professional relationships can lead to career opportunities, mentorship, and valuable insights into industry trends.

Time Management and Organizational Skills: Soft skills such as time management, organization, and attention to detail contribute to productivity and efficiency in a fast-paced work environment.

Self-Motivation and Learning Agility: The future of work demands continuous learning and self-motivation. Proactive individuals seeking new skills and knowledge will be better positioned for success.

Conflict Resolution: The ability to resolve conflicts and negotiate effectively is crucial for maintaining productive work relationships and minimizing workplace disruptions.

4. Conclusion

Adapting to the future of work presents both exciting opportunities and formidable challenges. Amidst uncertainties, individuals who are well-prepared can find numerous prospects. Strategies such as continuous learning, embracing remote work, and emphasizing soft skills can effectively address challenges like automation, job insecurity, and skills mismatch. Additionally, the concept of Universal Basic Income stands as a potential safety net for those at risk of being adversely affected by these transformations.

Looking forward, it is evident that the landscape of work will keep evolving. While it brings about challenges, it also holds the promise of enhanced flexibility, fresh opportunities for meaningful work, and the potential for a more balanced work-life dynamic. Successful navigation of this future requires collaboration among individuals, organizations, and policymakers. The goal is to ensure that the benefits of this transformation are equitably shared, leaving no one behind. By embracing change and proactively tackling challenges, we can construct a future of work that is inclusive, gratifying, and sustainable for all. Planning every element in of the work for a better future is essential to adapt to the myriad forces. Therefore, the essay fairly meets its objective of highlighting the paradigm shift that the world is going through. In other words, the world is not moving, but is already operating in the presence of the 'Future of Work"

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About the Author:

Sonali Narbariya has over nine years of experience including corporate and academia. She holds a full time PhD degree in Management from IBS Hyderabad. Her Doctoral Dissertation focuses on Change Readiness for Digital Transformation amongst IT sector employees in India. She has over five years of corporate experience while working different Global Fortune 500 Companies like, J.P. Morgan, TATA Consultancy Services and Thomson Reuters. Prior to pursuing the doctoral degree, her corporate experience mainly focused on Talent Acquisition and HR Automation. As a scholar, Dr. Narbariya was also involved in a Government Consultancy project for designing/ adapting a psychometric tool for skill mobilization of backward classes in India with Indian Institute of Management Indore (A project by, National Backward Class Finance & Development Corporation (NBCFDC), under the Ministry of Social Justice and Empowerment). This project work has made a pivotal contribution to Pradhan Mantri-DAKSH Yojana. A number of conference (National/ International) and research paper publications count to her credit. Her interest areas include Change Management, Leadership, Strategic Human Resource Management and People Analytics. She can be contacted at sonali.narbariya@nmims.edu.

TECHNOLOGY-DRIVEN OPERATIONS EXCELLENCE

Pradeep Pai

Deputy Director, NGASCE

SVKM's Narsee Monjee Institute of Management Studies
(NMIMS), Mumbai, Deemed-to-be-University, India.

Tohid Kachwala*

Professor, Operations and Data Sciences, School of Business Management,
SVKM's Narsee Monjee Institute of Management Studies
(NMIMS), Mumbai, Deemed-to-be-University, India
Email: tkachwala@sbm.nmims.edu

Abstract: Operations Excellence transformed the mindset within a manufacturing organization, making everyone customer-centric. Technology-driven organizations adopt a strategy where the business model is technology-centric and uses technology for innovation and growth. Combining these terms, Technology Driven and Business Excellence, we have "Technology driven Operations Excellence". The Education industry is one colossal service sector where we ingrain the quest for excellence. The business processes are system-driven and operate with well-defined SOPs. We explore the benefits and challenges of such a system in running the operations of leading B-schools, be it the assessment faculty allocation or the allocation of limited resources across multiple programs and courses. We also discuss Challenges and Barriers to Technology-driven Operations Excellence for the education field operations. Business schools are likely to play an increasingly critical role in future C-suite executives thinking through the implications of AI adoption.

Key Words: Operations Excellence, Technology, Education Industry, Artificial Intelligence

1. Introduction

Dr. Joseph Juran introduced "Operations Excellence" in the early 1970s while teaching business leaders quality concepts and how to improve them. The US manufacturing companies, especially the automobile companies, went through a crisis in the 1980s and were forced to adopt the Juran model to compete with superior Japanese automobiles. Operations excellence transformed the mindset within a manufacturing organization, making everyone customer-centric. The "value-addition" activity was any activity the customer was willing to pay. Doing quality checks a hundred times was not a "value-add" as we could avoid in the first place. This concept of value-add gathered traction and led to the development of multiple methods like lean thinking and Six Sigma. Although management applied the Japanese excellence methods to the shop floor and in the products business, quality improvement extended to services with newer techniques like Six Sigma. The education industry is one colossal service sector that needs excellence always. Multiple accreditations like AACSB (Association to Advance Collegiate School of Business, EQUIS (EFMD et al.), and AMBA (Association of MBAs) are sought after by every B-school.

Technology-driven organizations adopt a strategy where the business model is technology-centric and uses technology for innovation and growth. Now, if we combine these two terms, technology-driven and business excellence, we have "Technology-driven Operations excellence." Technology-driven operations excellence is more workable in the services than in the product sector. This is because implementing the changes in a service industry is without limitations of physical layout changes, as required in a production or manufacturing setup. We will consider the example of a leading B school to see the application of this concept, its uses, limitations, and advantages. We will also discuss a model and the process to make this concept workable.

In 2022, the artificial intelligence research and development company OpenAI developed generative AI Natural Language Processing (NLP) software ChatGPT. ChatGPT is a free tool accessed with internet connectivity and a compatible device for all end-users. The education industry finds ChatGPT

extremely useful in setting examination question papers and other assessments, while it is also concerned with the plagiarism possibilities by students. While ChatGPT is one such AI development, Google Bard is another tool. While the students are digital natives, the faculty is a step behind these digital natives, which is one of the primary reasons for concerns against AI in education. As per the Dean of Columbia Business School, Prof (Dr.) Costis Maglarus, "ChatGPT has dramatically changed what we need to do in the classrooms."

Other Business schools are still catching up in adapting the generative AI modules in their curricula. The Kellogg School of Management at North-Western University offers the "MBAi," an artificial intelligence-focused joint program with the McCormick School of Engineering. The master of quantitative management degree at Duke's Fuqua School of Business includes new coursework on how AI models work. At the University of Pennsylvania's Wharton School, a new course on AI addresses ways of improving managerial decision-making with data and algorithms. Similarly, Stern School of Business New York has launched GenerativeAI@Stern to train all the important stakeholders on best practices.

Let us examine the steps involved in achieving Operations Excellence in a B-school using technology.
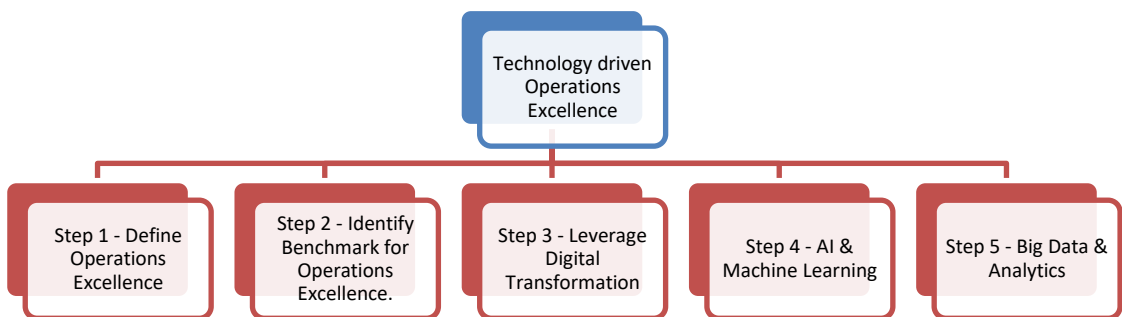

Figure 1: Technology-Driven Operations Excellence Model.

Step 1: For the business, define what operations excellence is.

The B-schools have assessments on students' progress grouped into Internal Continuous Assessment (ICA) and the term end exams (TEE). Timely conduct

of exams and evaluation of the answer books is the primary requirement in education. The question papers should be within the syllabus, different from the earlier conducted exams for the same course, and the level of difficulty should be commensurate with the program objectives. ChatGPT can generate question papers that measure up to the requirements and help assess the papers. We could put a metric like an exam process, which currently requires 45 days from the start to the end of the cycle and should be completed in a shorter duration of 35 days.

An essential requirement in the business of education is in providing timely feedback to the stakeholders, especially students, and in monitoring their progression. The ICA performance will effectively convey whether the student performs as expected or requires corrective remedies. Academic resources, like journals, should be efficiently used, and generative AI is instrumental in performing this requirement. Likewise, academic class scheduling and optimizing the scheduling process for efficient use of resources gets done by generative AI.

To attain Operations Excellence, we need first to define what is the requirement to excel in each of these areas.

Step 2: Identify the pillars (benchmarks) for Operation Excellence.
The global rankings always help in identifying the best B-school and benchmarking the various operations with these institutes always provides valuable insights. The feedback mechanism at the Wharton School of Business or the case study pedagogy at the Harvard Business School becomes the reference point for the B-schools, lower in the rankings. Generative AI would be able to benchmark the processes identified with the processes of the B-school in question and suggest/identify the limitations. What would be the benchmark for the best B-schools? Well, the process of Benchmarking is scientific and requires a better or higher-ranked organization to compare. The best B-schools can then look outside the industry, where there are superior processes and times for benchmarking. The lower-ranked institutes can

continue benchmarking with the best institutes. A tracker of past performance and current performance also helps in monitoring processes.

Step 3: Leveraging Digital Transformation.
Digital transformation is not just about the advent of new (and better) software/technology. It is the application of technology to increase computing capability and minimize human error. A simple but efficient use of the Box plot will help in making multiple analyses and inferences on the student performance and the inputs provided to the students. John Tukey was a visionary in the field of statistics and data analysis. He believed in the power of simple yet effective visualization techniques, which led to the creation of the box plot.

A box plot provides a clear and comprehensive representation of a dataset, allowing viewers to extract a wealth of information at a glance. One of the box plot's greatest strengths is its ability to compare two or more data distributions easily. Here is how it achieves this:

1. Neat Visualisation: Box plots present data clean and organized, making it easy for viewers to interpret it without unnecessary distractions or clutter.
2. Identification of Outliers: The data points outside the whiskers make it simple to spot anomalies in the dataset.
3. Comparing Multiple Distributions: By placing multiple box plots side by side, one can visually compare the statistical characteristics of several data distributions in a single view. This is particularly useful to understand the differences between groups or categories.

Box plots have existed for quite some time, and the analysis of student performance or class performance is possible with these plots. How does generative AI help here? The generative AI will help in performing the analysis tasks which was done manually. The construction of the box plot requires considerable effort, with Python and R having different codes. ChatGPT gives us the code for constructing the box plots, and much time is saved in creating these plots.
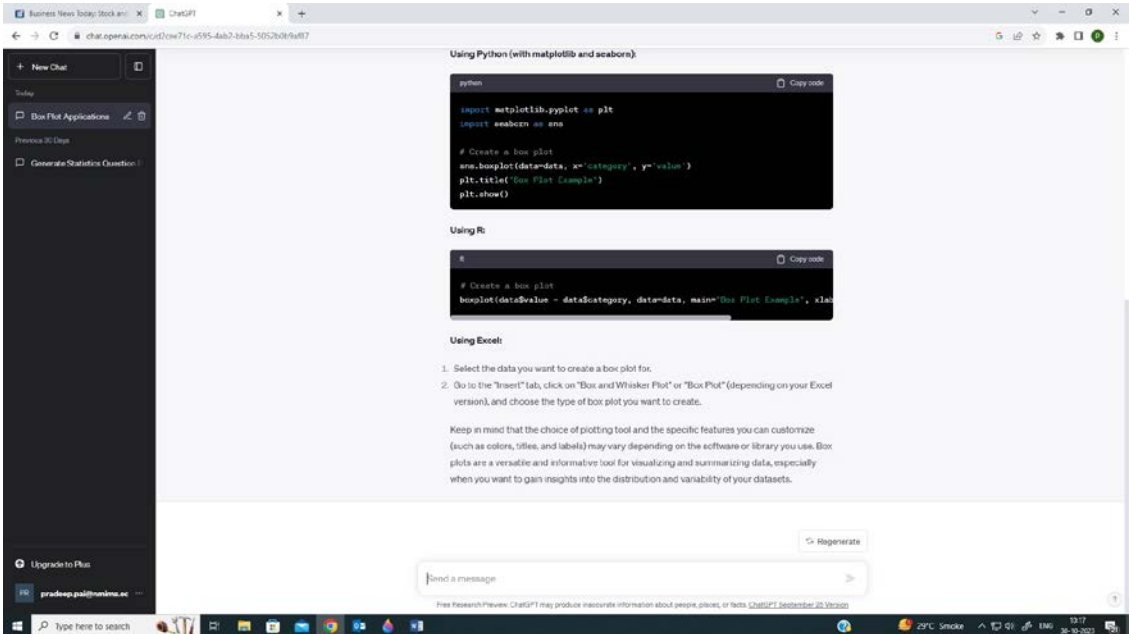
Figure 2: Screen grab of ChatGPT output.

As shown in Exhibit 2, ChatGPT has provided the codes for Python, R, and Excel to plot a box plot. It, however, cannot be used to make standard comparisons and provide conclusions on graphs or plots, which would still require manual effort.

Step 4: Artificial Intelligence and Machine Learning (AI & ML):

AI ML is increasingly integrated into education, offering enhanced teaching methods and streamlined administrative processes. Some critical uses of AL & ML are personalized learning, intelligent tutoring systems, automated grading and assessment, early corrective intervention, Natural Language Processing, educational content generation, smart content recommendation, administrative efficiency, educational data analytics, and virtual augmented reality.

However, it is essential to note that integrating AI and ML into education also comes with challenges and considerations, such as data privacy, ensuring the algorithms are unbiased, and providing adequate training for educators to use these technologies effectively. Additionally, AI and ML should complement,

not replace, human educators and maintain a balance between technology and human interaction in the learning process.

Step 5: Big Data and Analytics.

How is Big data analytics different from AI ML? Most of the time, these work together, but it is poignant to know the differences. AI focuses on systems or machines that perform tasks requiring human intelligence. Big data analytics, on the other hand, is primarily concerned with processing and analyzing large volumes of data to discover patterns, trends, and insights. AI uses data to learn, adapt, and make predictions. Big data does not build models but examines data for meaningful insights into patterns and trends. The goal of AI is to create intelligent systems that can perform tasks autonomously, learn from data, and adapt to changing conditions. AI systems aim to make decisions, solve problems, or simulate human-like thinking. The goal of Big Data Analytics is to extract knowledge and insights from data to support decision-making and improve processes. It does not aim to build intelligent systems but to provide actionable information. Simply put, Big data analytics is NOT a learning tool, while AI ML is a learning tool.

Big Data Analytics finds applications in education in the following areas,
- Student Performance Analysis,
- Early warning systems,
- Personalized learning,
- Curriculum optimization,
- Predictive Analytics during enrolment,
- Resources allocation,
- Educational Research,
- Learning Management Systems (LMS),
- Assessment and Testing,
- Quality Assurance,
- Administrative efficiency.
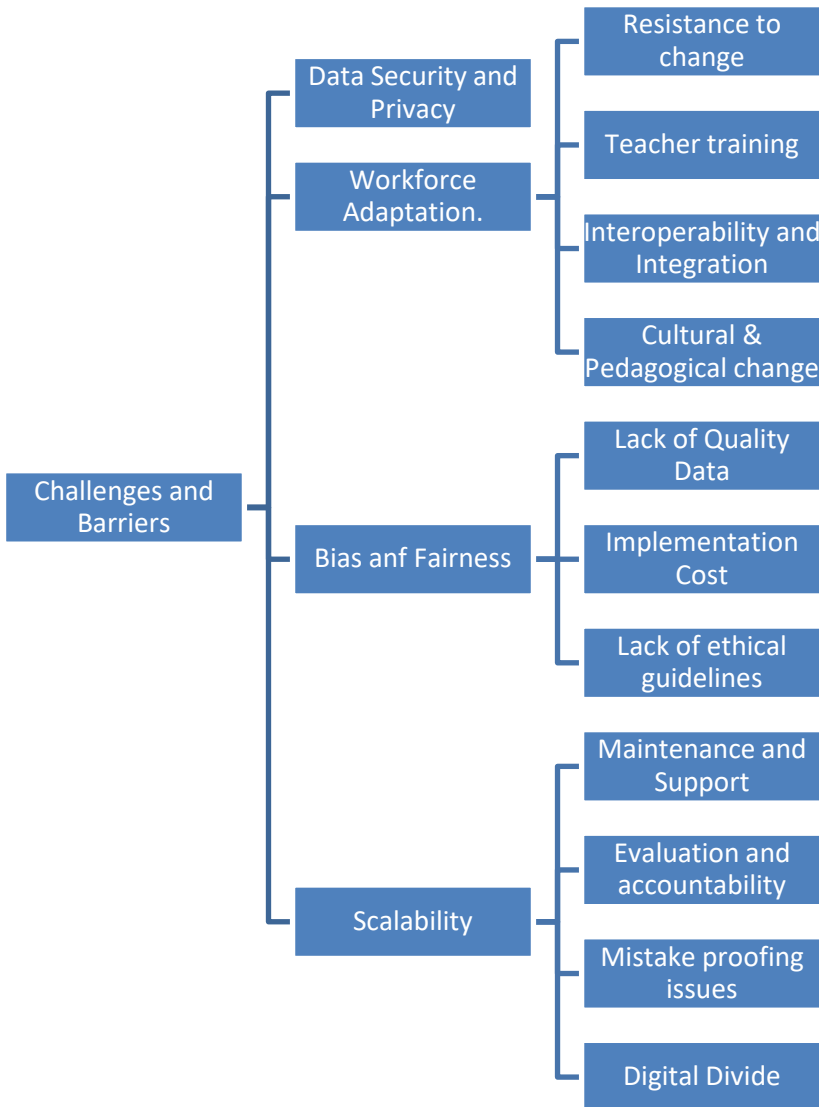
2. **Challenges and Barriers:**

Figure 3: Challenges and Barriers to Technology-driven Operations Excellence.

There are broadly four types of challenges to technology-driven operations excellence. While some of these barriers are generic to technological changes, some, like "Bias and Fairness," impact the education field operations more.

Data Security and Privacy: Student data is stored in much detail at the university and the Institutional level. Unauthorized access would be the primary source of data leaks and should not be allowed under any circumstances. Data breaches should also be prevented. Compliance with data

protection regulations (e.g., GDPR or FERPA) can be complex and requires ongoing attention.

Workforce acceptance is a second big challenge for technology-driven operations excellence. Besides the challenge of adaptation to newer technologies resulting in changes in how work is done, the primary aspect of change is disliked. In the case of technology-driven organizations, not only are changes inevitable, but the rate of change is also much faster. The education industry has a mix of senior faculty and junior faculty. While the junior faculty is more amenable to change, the senior faculty will find it more manageable. When the change is made mandatory, it only adds to the anxiety, which impacts the concept of Operations Excellence.

Further, the inevitable result of technological advances is the reduction of human intervention and people employed. All of this hurts any changes being envisaged with advanced technology. Short-comings of the technology get identified, and discussions on why the technology is not helping abound.

In other businesses and functions, the stakes are higher. White-collar workers face the threat of automation for the first time, and government regulators worldwide struggle to keep up. Close to three-quarters of Fortune 500 chief human resources officers foresee AI replacing jobs in their companies over the next three years, according to a recent survey by polling firm Gallup. Whether other executives opt to downsize or retrain employees for new roles is a question that will have far-reaching consequences. However, indeed, the anxieties related to technology-driven operations excellence remain.

To a large extent, these anxieties surrounding the workforce adaption of technology are addressed by organizing proper training and sufficient demonstrations of the usefulness of better technology. SPSS Statistics is a statistical software suite owned by IBM and is helpful for statistical techniques like multi-variate analysis, advanced analytics, factorization, and predictive forecasting. SPSS Statistics is the most commonly used software in most B-schools. JMP is a suite of computer programs for statistical analysis developed

by a subsidiary of SAS Institute. Although both the software work in much the same manner, faculty used to SPSS will find migrating to JMP extremely inconvenient. Likewise, faculty comfortable with JMP will find SPSS slow and operationally tricky. (SPSS requires connection to a central server through approved links, while JMP gets embedded in individual machines).

A third concern with regenerative AI or technology-driven operations is that biases get fed into the system, and the output would thus be anything but fair. For example, a senior faculty teaching Equity markets is biased against technical analysis, as he believes that only fundamental analysis is the best way to success. The technology-driven regenerative AI is thus likely to conclude that fundamental analysis is better than technical analysis and might design the course and the assessments with more weightage to the fundamental analysis of markets rather than equal weightage to both technical and fundamental analysis. Technology-driven operations are driven by the person driving the technology, which could cause personal biases to creep in. Although this concern can be addressed by having a team of faculty setting instructions for the regenerative AI system, it still needs improvement because the senior faculty could influence the process. At times, if there is some research work on a new medicine or approach to medication, there is significantly less data for the regenerative AI to make inferences, which could also result in anomalous outputs.

Finally, the scalability of the technology also poses a challenge. During the COVID pandemic, the classes were conducted online, and it was observed that many students did not have access to terminals to view the online classes. Likewise, if the technology requires some unique adaptations, it might not be easy. The JMP software is accessible to the end user as long as he is a student but has to pay a hefty fee once he starts working in the industry. A student familiar with working on JMP will then find it challenging to use all these concepts and techniques when he would require it most, i.e., in practice.

Examples of Technology driven Operations Excellence using regenerative AI:

1. Healthcare - IBM Watson for Oncology provides treatment recommendations based on the latest Research, enabling doctors to make informed decisions.

2. Finance – JPMorgan Chase developed Contract Intelligence that uses AI to review and interpret commercial loan agreements. This system processes documents in seconds, significantly reducing the time required for manual review and improving operational efficiency, thus leading to Operations Excellence.

3. Retail – Amazon Go use AI to provide a cashier-less shopping experience. Manual intervention is thus reduced manifold, and the system's operational efficiency is improved multi-fold.

4. Manufacturing – Foxconn, a major manufacturer of electronic products, has implemented AI-powered robots to assist with tasks like assembling smartphones and other devices. These robots can handle repetitive and precise tasks with high efficiency.

5. Transportation – Waymo has developed a fleet of autonomous vehicles that use AI and machine learning to navigate and operate safely on the roads. These self-driving cars are being tested in various locations.

6. Agriculture – The Climate Corporation's FieldView: The Climate Corporation, a subsidiary of Monsanto, uses AI and data analytics to help farmers make data-driven decisions about planting, irrigation, and harvesting. Their FieldView platform provides insights into field conditions to optimize crop yields.

7. Education – ScribeSense for Note-taking: ScribeSense is an AI-based tool that assists students in taking notes during lectures. It listens to the lecturer's speech and automatically generates summarized notes, providing a valuable resource for students.

8. Energy – DeepMind's AI for Data Centre Cooling: DeepMind, a subsidiary of Alphabet, partnered with Google to use AI for data center cooling. The AI system analyzed patterns in data center operations and recommended

changes to reduce energy consumption, leading to significant energy savings.

9. E-commerce - Alibaba's FashionAI: Alibaba's FashionAI is an AI-powered shopping experience that uses computer vision to help customers choose outfits. It can suggest clothing items and accessories based on what the customer tries in the store.

10. Smart Cities - Singapore's AI-Powered Traffic Management: Singapore employs AI to manage its traffic, including adaptive traffic lights, predictive analytics for public transportation, and data-driven urban planning to improve traffic flow and reduce congestion.

3. Some Concerns Specific to the Education Industry:

As per Yuan-Sen Ting (Australian National University) there are some pertinent concerns related to ChatGPT or any other regenerative AI technology in the education Industry,

1. Prof Ting discovered that ChatGPT could score better than 90% of his students in a problematic statistics paper, which meant that the regenerative AI was adept at answering examination questions. The students are bound to use this tool in aiding them to answer the question papers during an exam, which would be an unfair means of the exam. Preventing this could be a primary concern for educationists and the academic administration.

2. Is AI-generated content plagiarism? Much emphasis in education is on the concept of originality of work. Whether it is a research paper for publication or a simple project submission by students, a plagiarism check is mandatory. Although the output of ChatGPT would be free of plagiarism, would it be ethically admissible? Firstly, it will be virtually impossible to ban the use of ChatGPT-type regenerative AI tools, and secondly, why can't we consider such tools as Machine Learning, which takes mundane tasks away from humans? Is it necessary for a student to remember all the problematic formulae used in statistical analysis? Why does the ML do the needful and allow the student time to make a

rational analysis of the output? In this context, we must note that ML differs from internet searches. While ML extracts inherent relationships from the data, it does not retrieve the most matching content. In a sense, this is not plagiarism, as ML does not "copy." Consider a lecture given by faculty in a class. It would be similar to the lecture given by a co-faculty in the other class, as both these faculties refer to the same course outline. The ideas revolve around the same concept but are different. The students should instead be encouraged to embrace the ChatGPT or the latest technology in enhancing their capabilities.

3. Would the student stop learning? Consider the example of Google Maps. These maps remove the stress of locating an address or the best way to reach the address. The time saved and the energy saved could be used for some other helpful process. What is at risk here is the traditional "rote" learning techniques, which we all agree are antiquated. Students come from diverse backgrounds and language skills. We had a student from Israel who could understand English but think and process information in Hebrew only. So she went through the painful process of converting English written notes into Hebrew, understood the same, and then converted her answers in Hebrew to English. Now, this process would be automatic with the language processing skills of the regenerative AI algorithm. It would free the student to get involved in the application of the topic rather than struggling to understand the topic.

4. Assessment techniques like Multiple Choice Questions (MCQs) are accessible for the regenerative AI to answer. This would require changing the evaluation pattern to more application orientation rather than seeking the answer.

5. Should the students be specialists or generalists? In this era of rapid change and competition, the accessibility of machine learning has made global competition unprecedentedly open. One approach would be to adopt the regenerative AI systems, make the courses more general than specific, and encourage students to enroll in general management courses.

4. Conclusion:

For future leaders, the stakes are high: White-collar workers face the threat of automation for the first time, and government regulators worldwide struggle to keep up. According to a recent survey by polling firm Gallup, close to three-quarters of Fortune 500 chief human resources officers foresee AI replacing jobs in their companies over the next three years. In May, International Business Machines Corp paused hiring for nearly 8,000 roles it thinks could be replaced with AI. Whether other executives opt to downsize or retrain employees for new roles is a question that will have far-reaching consequences. Business schools may play an increasingly critical role in future C-suite executives' thinking through the implications of AI adoption.

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About the Authors

Pradeep Pai has a B.E. (Production) and MMS from the University of Mumbai in 1989 and 1991, respectively, and a Ph.D. (Business Management) in 2021 from Aligarh Muslim University in 2023. He has over 22 years of teaching experience.

T Kachwala, Professor, School of Business Management (NMIMS, Mumbai) B.E. (Mechanical Engineering) from VJTI, MAM from NMIMS, Ph.D. (Management) from North Gujarat University. He has published over 20 research papers/book chapters in refereed journals and conferences and is a coauthor/ author for two textbooks. He has over 27 years of part-time/full-time teaching experience in Operations Management and Decision Science subjects and 13 years of industry (factory) experience at Godrej Appliances Limited. He can be contacted at tkachwala@sbm.nmims.edu.

About the Book

In the dynamic landscape of the 21st century, technological disruption emerges as an undeniable force reshaping industries and businesses. The edited book, "Digital Paradigm Shift: Unraveling Technological Disruption in Business," offers a comprehensive, multidisciplinary exploration of this phenomenon. Drawing on insights from diverse disciplines, each chapter delves into upcoming technology-facilitated services, addressing their challenges across various domains. Academic experts present actionable strategies, empowering businesses not only to survive but thrive amid this upheaval.

Central to this exploration is the interconnectedness of businesses, industries, and technologies, spotlighting the concept of an integrated, connected digital business ecosystem. The book navigates strategic positioning within these ecosystems, fostering synergies, innovation, and resilient networks capable of withstanding disruptive forces.

An insightful conclusion casts a forward-looking gaze upon the future of technological disruption from an organizational standpoint. By scrutinizing emerging trends and potential scenarios, readers gain the foresight needed to proactively navigate the evolving nexus of technology and business. This resource serves as an indispensable guide for business leaders, entrepreneurs, scholars, academics, and industry practitioners seeking to comprehend and leverage the transformative potential of integrating technological solutions within the contemporary business ecosystem. It equips them with the requisite knowledge to harness innovation and adapt to the ever-evolving technological landscape effectively.

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